

MINERALOGICAL ABSTRACTS

(Vol. 7, No. 10, June, 1940.)

Notices of Books.

ANNSEN (Albert). *A descriptive petrography of igneous rocks*. Vol. 1. *Introduction, textures, classifications and glossary*, 2nd edition, (Chicago (Univ. Chicago Press), 1939, xxiv+318 pp., 1 pl., 145+5 text-figs. Price \$4.50. [Cambridge Univ. Press, Price 27s.]

An increase of 52 pages on the first edition of vol. 1 in 1931 [M.A. 33] is accounted for by the addition of a useful new appendix 'Definitions of rocks' giving an alphabetical list of about 850 rock-names, with mention of their authors but without dates. Another section describes the newer rock classifications of A. Lacroix (1933) and W. E. Tröger (1935); and a short battle with Niggli on the author's classification appears under the picture of a curious weapon on p. 100. The general index now omits the inconsistent entries to localities. Otherwise the text is exactly as before, including the few misprints corrected in the first edition.

L. J. S.

DOLIVO-DOBROVOLSKY (V. V.) [Доливо-Добровольский Вад. В. 1904-36], *et alii*. Определитель кристаллов.—DOLIVO-DOBROVOLSKY (W. W.) *et alii*. *Bestimmungstabellen für Kristalle*. Vol. 1, part 2. I. Тригирная и гексагирная сингонии. Общее дополнение к средним сингониям. II. 2-е и 3-е дополнения к тетрагирной сингонии.—I. *Trigyrische und hexagyrische Syngonien*. II. *Allgemeine Ergänzung zu den mittleren Syngonien*. II. *Anhang 2 und 3 zu den tetragyrischen Kristallen*. Leningrad & Moscow (Central Scientific Institute for Geology and Prospecting), 1939, 863 pp., 22 pls., 207+12 text-figs. Price 24 rub. (bound 25 rub. 75 kop.). This large volume is a continuation of the determinative tables based on the goniometric measurement of crystals, part 1 of which was published in 1937 [M.A. 7-167]. It gives detailed data for 1245 substances which crystallize in the rhombohedral (675) and hexagonal (570) systems, together with key lists of the polar angles ρ arranged in numerical order. Long appendices (pp. 769-854) giving supplementary data for tetragonal crystals show that work of this kind can never be complete. The strenuous work of compilation has been undertaken by 17 persons, whose names appear on the title-page. Portraits are given of two of

these: V. V. Dolivo-Dobrovolsky [Min. Mag. **25**–238] and Y. P. Preobrazhensky (Ю. П. Преображенский, G. P. Preobraschensky, 1910–
L. J. S.

New Minerals.

HILLER (J. E.). *Über den Falkmanit*. Zeits. Krist., 1939, vol. pp. 138–142.

Needles of so-called jamesonite from Minas Geraes yield a photograph identical with that of boulangerite. Weissenberg photographs about the needle axis b yield, however, a 24·93, b 8·10, c 14·51 β 79° 10', whereas new values for boulangerite [M.A. 7–231] are a 17 b 8·04, c 14·83 Å. X-ray methods show that the mineral from Minas Geraes is identical with the new mineral falkmanite recently described and named by P. Ramdohr and O. Ödman from Bayerland mine, Pfaffenreuth, Bavaria, and also with undescribed material from Boliden, Sweden. Falkmanite from Pfaffenreuth has sp.gr. 6·2 and its chemical analysis yields a unit-cell content of $10\text{Pb}_3\text{Sb}_{2\cdot08}\text{S}_{6\cdot76}$. The author considers, however, that the ideal formula is $\text{Pb}_3\text{Sb}_2\text{S}_6$. F. A. J.

NEUMANN (Henrich). *Armenite, a new mineral. Preliminary note*. N. Geol. Tidsskrift, 1939, vol. 19, pp. 312–313.

Armenite was found on a specimen collected in 1877 from the siliceous bearing calcite veins of the Armen mine near Kongsberg, Norway, in association with pyrrhotine, axinite, and quartz. The prismatic pseudohexagonal (orthorhombic?) crystals are colourless and have two cleavages. Sp. gr. 2·77, H. 7–8, α 1·551, β 1·559, $2V$ 60°, negative. The composition is $\text{BaCa}_2\text{Al}_6\text{Si}_8\text{O}_{28}\cdot 2\text{H}_2\text{O}$, and the systematic position of the mineral, hitherto labelled as 'epidote', is as yet uncertain. L. J.

[GERASIMOVSKY (V. I.)] GERASSIMOVSKY (V. I.) Герасимовский (В. И.). *Lovozerite—a new mineral*. Compt. Rend. (Doklady) Acad. URSS, 1939, vol. 25, pp. 753–756.

Lovozerite occurs as grains, together with eudialyte, &c., in pyritic lujavrite in the Lovozero tundra, Kola peninsula. Large (1–2 cm.) grains of the primary mineral with inclusions are black with resinous lustre and brown streak; H. 5, sp. gr. 2·384. In thin section pink, optically uniaxial, negative, ω 1·561, ϵ 1·549. Twinning, the principal axes of the two individuals at 73–74°, is sometimes pseudosynthetic. The mineral is insoluble in acids, and it fuses to a pinkish white bead. Smaller (0·03–0·3 cm.) grains of secondary material

rived from eudialyte are pale pink and free from inclusions. Analysis T. A. Burova, SiO_2 52.12, TiO_2 1.02, ZrO_2 16.54, rare-earths 0.56, O_3 0.40, Fe_2O_3 0.72, MnO 3.46, MgO 0.76, CaO 3.34, SrO 0.06, H_2O 3.74, K_2O 1.90, $\text{H}_2\text{O} +$ 8.62, $\text{H}_2\text{O} -$ 6.41, Cl nil = 99.65, gives formula $\text{R}_2\text{O} \cdot \text{RO} \cdot (\text{Zr}, \text{Ti})\text{O}_2 \cdot 6\text{SiO}_2 \cdot 3\text{H}_2\text{O}$. The mineral differs from eudialyte in containing less alkalis and more water. L. J. S.

PROIX (Alfred). *Les gisements de phlogopite de l'extrême-sud de Madagascar*. Compt. Rend. Acad. Sci. Paris, 1940, vol. 210, pp. 273–276.

These deposits are in pyroxenite and very similar to those of eastern Canada. That at Betroka has now been worked to a depth of 80 m. Now a layer which has been leached by surface water, and one in which a material has been re-deposited, is the intact zone, where the original minerals are unattacked. These are all distinguished by the large size of their crystals, and consist of green or greyish diopside as crystals up to 10 cm. across, red and yellow calcite, and phlogopite of which one crystal measured 3.5×1.2 m. In smaller amounts there also occur: zirconite as blue or green crystals up to 70 cm. in diameter, anhydrite, garnet, deep-green spinel, and allanite rich in Ce and La, with small quantities of Pr, Nd, Sm, and Th. *Seyrigite*, a new mineral, is found in the weathered zone at Ambondrombe as broken, golden-yellow, transparent, tetragonal crystals up to 7 cm. across; its lustre is vitreous to resinous, d 5.484, and in composition it is intermediate between zirconite and powellite, containing 24.01% MoO_3 . Enormous crystals of zirconite, together with a little molybdenite, pyrrhotine, pyrite, and bornite, and scapolite and anorthite are also found. C. A. S.

COCK (M. A.). *Rammelsbergite and pararammelsbergite, distinct orthorhombic forms of NiAs_2* . Amer. Min., 1939, vol. 24, no. 12, pp. 10–11; 1940, vol. 25, pp. 211–212 (abstract).

X-ray examination of rammelsbergite from Schneeberg in Saxony (Eisleben in Thuringia) gave a unit cell, a 3.53, b 4.78, c 5.78 Å., containing 2NiAs_2 ; space-group $Pmnn$; holohedral orthorhombic, twinning (110), cleavage (110). Material recently described as rammelsbergite from Cobalt and Elk Lake in Ontario [M.A. 7–507] gave a unit cell a 5.74, b 5.81, c 11.405 Å., containing 8NiAs_2 ; space-group $Pbma$; orthorhombic (or pseudo-orthorhombic) and apparently holohedral, twinning (001). The latter is now named pararammelsbergite.

L. J. S.

SCHALLER (Waldemar T.). *A probable new phosphate-sulphate of alunogen from Utah*. Amer. Min., 1939, vol. 24, no. 12, pt. 2, pp. 12-14, 1940, vol. 25, pp. 213-214 (abstract).

A scaly white mineral resembling alunogen in appearance and properties is found with halotrichite, siderotile, and szomolnokite in the Tintic Standard mine at Dividend. It is readily soluble in cold water and has the composition $2\text{Al}_2\text{O}_3 \cdot 4\text{SO}_3 \cdot \text{P}_2\text{O}_5 \cdot 24\text{H}_2\text{O}$. Written as



this is analogous to alunogen ($\text{Al}_2(\text{SO}_4)_3 \cdot 16\text{H}_2\text{O}$) with HPO_4 replacing SO_4 , but it contains less water, none of which is given off at 105° whereas alunogen loses 30% H_2O at 105° . L. J. S.

LEPIERRE (Charles). *Yttrocolumbite de Moçambique*. Mem. Acad. Ciências de Lisboa, Cl. Ciê., 1937, vol. 1, pp. 369-375.

The following analysis (full details are given of the method of analysis) of a black mineral with vitreous lustre and brown streak, sp.gr. 5.49, H. 5, indicates yttrotantalite, but with niobium in excess of tantalum, and it is called yttrocolumbite or, better, yttro-columbitantalite. Formula, $(\text{Fe}, \text{Mn})_2(\text{Nb}, \text{Ta})_2\text{O}_7$ with $(\text{UO}_2)_2(\text{Nb}, \text{Ta})_2\text{O}_7$ and $\text{Yt}_4[(\text{Nb}, \text{Ta})_2\text{O}_7]_3$. Nb_2O_5 31.21, Ta_2O_5 21.50, Yt_2O_3 , &c., 14.06, Ce_2O_3 , &c., 2.01, ThO_2 2.65, UO_3 3.10, ZrO_2 0.25, SiO_2 1.78, TiO_2 1.20, Al_2O_3 1.62, Fe_2O_3 10.52, MnO 5.08, MgO 0.66, CaO 1.87, SnO_2 0.66, As_2O_5 0.13, loss on ign. 1.33 = 99.60. The mineral is strongly radioactive (0.96 compared with U_3O_8). L. J. S.

MINGUZZI (C.). *Un nuovo silicato di rame e calcio fra i prodotti vesuviani*. Atti X Congr. Internaz. Chimica, Roma, 1938, vol. 2, pp. 725-730. Chimica e Industria, Milano, 1938, vol. 20, p. 278.

Further data for 'cuprorivaite' [M.A. 7-225] are: α 1.589, β 1.627, γ 1.6275, $2V$ $13^\circ 14'$; pleochroism strong, α yellowish, β and γ blue. The analysis, after deducting quartz but not sulphate and carbonate, is now stated as: SiO_2 59.36, SO_3 1.25, CO_2 1.36, Al_2O_3 2.45, Fe_2O_3 0.45, CaO 13.95, CaO 14.07, K_2O 1.22, Na_2O 2.91, H_2O 2.98 = 100.00, approximating to $2\text{RO} \cdot 4\text{SiO}_2 \cdot \text{H}_2\text{O}$. L. J. S.

RAO (M. B. Ramachandra). *A note on the bababudanite-rhodusite relationship*. Rec. Mysore Geol. Dept., 1939, vol. 37, pp. 68-79.

A member of the blue soda-amphiboles intermediate in composition between glaucophane and riebeckite is called ferriglaucophane. From the published analyses and optical data it is suggested that rhodusite

.A. 2-221] is a ferriglaucophane and that bababudanite [M.A. 6-212] between this and riebeckite.

L. J. S.

AVRINECZ (Gábor). *Ásványrendszertani tanulmányok, III. Kategóriák, tagozat, új kötelékek.*—VAVRINECZ (G.). *Mineralsystematologische Studien, III. Kategorien, Gliederung, neue Verbände.* Földtani Közlöny, Budapest, 1939, vol. 69, pp. 81-100, 2 pls. (German with Hungarian summary.) [M.A. 6-376, 7-361.]

Details, with five tables, are given of a new mineral-system which includes the following main classes: I, elements; II, compounds of elements of the fifth series in the periodic classification (N, P, As, Sb, Bi); III, compounds of the sixth series (S, Se, Te); IV, compounds of oxygen; V, compounds of the seventh series (F, Cl, Br, I); and VI, compounds of the fourth series (C, Si). The author's definition of a mineral includes gases—atmospheric, volcanic, and other exhalations; and the following new names are proposed for these: hydrothionite (H_2S), thanite (COS), rhodanite (HCNS), carbonyl (CO), mofettite (CO_2), and sulfurosite (SO_2). At least 1500 mineral names are considered to be superfluous.

V. Z.

Artificial Minerals.

ANDER (J. L.) & GRUNER (John W.). *Action of alkali sulphide solutions on minerals at elevated temperatures.* Econ. Geol., 1939, vol. 34, pp. 537-560.

Various rock-forming minerals were heated at 300°C . for a week with sulphide solutions in gold-lined bombs. With H_2S and NaHS iron-bearing minerals generally yield pyrite, but with Na_2S they yield magnetite, haematite, and FeS . Other minerals produced include prehnite, quartz, opal, olivine, acmite, analcime, chlorite, anhydrite, pyrrhotite, crystals of gold, and probably kaolin and nontronite.

L. J. S.

ANDER (A. M.) & HAMLYN (W. T.). *Pyrosynthesis, identification and study of tin sulphides and of compounds of tin sulphides with antimony and lead sulphides.* Econ. Geol., 1938, vol. 33, pp. 868-888, 19 figs. Equilibrium diagrams are given for the systems Sn-S , Sn-Pb-S , and Sn-Sb-S , and the different phases were identified on polished sections and iridescent filming tests [M.A. 7-282, 404]. Of the tin sulphides, SnS , Sn_2S_3 , and SnS_2 , the first as 'needles' [? sections of thin folia] identified with herzenbergite [M.A. 6-261-2]. SnS and Sn_2S_3 form

solid solutions in PbS; teallite could not be prepared. Antimony compounds are Sb_2S_3 , $\text{SnS}.\text{Sb}_2\text{S}_3$, $3\text{SnS}.\text{Sb}_2\text{S}_3$, and $3\text{Sn}_2\text{S}_3.\text{Sb}_2\text{S}_3$ (4SnS. $\text{Sn}_2\text{S}_3.\text{Sb}_2\text{S}_3$). L. J. S.

GAUDIN (A.M.) & DICKE (Günther). *The pyrosynthesis, microscopic study and iridescent filming of sulphide compounds of copper with arsenic, antimony and bismuth*. Econ. Geol., 1939, vol. 34, pp. 49–214–232, 35 figs.

The metals in various proportions were melted with sulphur in a bomb, and the following minerals were identified on polished sections by iridescent filming tests: chalcocite, covellite, famatinite (three varieties), and an arsenical solid solution, probably stibioluzonite), tetrahedrite (three varieties), chalcostibite, stibnite, enargite (and an arsenical solid solution, probably luzonite), tennantite, realgar, bismuthinite, cuprobismutite (for which a formula $\text{CuS}.\text{Bi}_2\text{S}_3$ is suggested), klaprotholite, and wittichenite. L. J. S.

KLUG (Harold P.) & HEISIG (G. B.). *The crystal structure of synthetic antimony trisulphide*. Journ. Amer. Chem. Soc., 1939, vol. 61, pp. 1920–1921.

Precipitated red Sb_2S_3 shows no evidence of crystalline structure. When heated at 115° it becomes black and then gives an X-ray pattern identical with that of stibnite. L. J. S.

HUBBELL (Dean S.). *The formation of atacamite by the incorporation of copper powder in magnesium oxychloride compositions*. Journ. Amer. Chem. Soc., 1937, vol. 59 (part 1), pp. 215–216, 1 fig.

Magnesium oxychloride cements attack metallic copper with formation of atacamite. M. H. H.

MICHEL-LÉVY (Albert) & WYART (Jean). *Synthèse de quartz, par pneumatolyse, à l'aide d'explosifs brisants. Formation d'inclusions liquides à libelle mobile*. Compt. Rend. Acad. Sci. Paris, 1938, vol. 208, pp. 1594–1595, 2 figs.

Detonation of a mixture of SiO_2 and hexogene in a closed vessel produced a pumiceous glass. But a similar experiment with addition of a little H_2O , followed by heating for 6 days at 545° , giving a pressure of over 3000 atmospheres, yielded cristobalite; while if a little K_2CO_3 is also added, the result is quartz with numerous inclusions containing

vable bubbles, quite similar to the inclusions in quartz from granite. [A. 7-282.] C. A. S.

WALTER (A.). *Valentinitbildung aus wässriger Antimontrifluoridlösung bei gewöhnlicher Temperatur*. Publications of the Department of Mining and Metallurgy of the Roy. Hung. Palatine-Joseph Univ. of techn. and economic sciences, Sopron (Hungary), 1938, vol. 10, part 1, pp. 169-172, 1 fig.

The precipitation of valentinite crystals is favoured when antimony fluoride solution stands in a glass vessel at ordinary temperature. From this fact it is suggested that Sb_2O_3 and other metal oxides may crystallize by the action of solutions of antimony trifluoride or of the corresponding fluorides on silicate rocks. V. Z.

BURN (Jack R. I.). *The chemical nature of precipitated basic magnesium carbonate*. Journ. Chem. Soc. London, 1940, pp. 96-99.

The precipitate obtained by slowly adding a solution of MgSO_4 to one of Na_2CO_3 has the composition $\text{MgO}:\text{CO}_2 = 1:0.888$ to $1:0.626$, the latter from weaker solutions. It is colloidal, but on standing in contact with the mother liquor it is converted into minute spherulites. The filtrate on standing deposits on the walls of the vessel stellate groups of colourless crystals of $\text{MgCO}_3 \cdot 3\text{H}_2\text{O}$ or $\text{Mg}(\text{OH})\text{HCO}_3 \cdot 2\text{H}_2\text{O}$ [quehonite]. Commercial 'magnesia alba' appears to consist of a mixture of this crystalline hydroxy-carbonate and amorphous material. L. J. S.

DER (Osias). *Sur les carbonates basiques verts de cuivre*. Compt. Rend. Acad. Sci. Paris, 1937, vol. 204, pp. 1200-1202.

The composition of synthetic and natural malachite is discussed; the natural mineral is $[\text{Cu}_2(\text{OH})_2]\text{CO}_3$, while the synthetic material contains an additional $\frac{1}{2}$ mol. H_2O which is expelled below 200°C ., the dehydration curve showing no break; the X-ray photographs of the natural and synthetic material are identical, hence the extra water is not constitutional. M. H. H.

AR (Suzanne). *Sur la précipitation, à froid, d'un sel cuivrique par un carbonate alcalin*. Compt. Rend. Acad. Sci. Paris, 1937, vol. 204, pp. 1739-1740.

The first product of precipitation, when equivalent proportions of Na_2CO_3 or NaHCO_3 and CuCl_2 , CuSO_4 , or $\text{Cu}(\text{NO}_3)_2$ are mixed, is

amorphous and ranges from $\text{CuO} \cdot 3\text{CuCO}_3 \cdot x\text{H}_2\text{O}$ to $5\text{CuO} \cdot \text{CuCO}_3 \cdot x\text{H}_2\text{O}$. After digestion under the mother liquors, malachite ($\text{CuO} \cdot \text{CuCO}_3 \cdot 1\frac{1}{2}\text{H}_2\text{O}$) is produced, or if the digestion is carried out under pressure of CO_2 , chrysotile ($\text{CuO} \cdot 2\text{CuCO}_3 \cdot 1\frac{1}{2}\text{H}_2\text{O}$); occasionally double salts containing alkali are formed. M. H. F.

- GENESLAY (Georges). *Action du sulfate et du nitrate cuivriques sur le cuivre pur.* Bull. Soc. Chim. France, 1937, ser. 5, vol. 4, pp. 111–116.
- *Sur la cuivre II carboxydiammine et ses produits de décomposition par l'eau et par la chaleur sèche.* Ibid., pp. 114–116.
- *Sur la corrosion du cuivre métallique par les solutions de chlorure de magnésium, à l'air humide et en atmosphère de CO_2 .* Ibid., pp. 117–118.
- *Action corrosive des carbonates alcalins et du carbonate d'ammonium sur le cuivre.* Ibid., pp. 120–122.
- *Les moisissures peuvent-elles modifier l'action du sulfate de cuivre sur le cuivre?* Ibid., pp. 123–125.

GUILLOT (Marcel) & GENESLAY (Georges). *Identification, par la méthode de Debye et Scherrer, de quelques constituants des patines de corrosion du cuivre.* Ibid., pp. 125–129.

A study of the action of metallic copper on solutions of CuSO_4 , $\text{Cu(NO}_3)_2$, MgCl_2 , alkali sulphates, chlorides, bromides, nitrates, carbonates, in air and in a CO_2 -atmosphere, and of the preparation and hydrolysis of $\text{CuCO}_3 \cdot 2\text{NH}_3$. Among the products cuprite, antlerite, gerhardtite, atacamite, and malachite were formed, and the conditions of the natural formation of some of these are discussed. M. H. F.

BINDER (Osias). *Définition des sulfates basiques de cuivre.* Ann. Chim. Phys., 1936, ser. 11, vol. 5, pp. 337–409, 2 pls., 3 text-figs.

A study of the system $\text{CuO}-\text{SO}_3-\text{H}_2\text{O}$ at 22° and 100° C. and of the hydrolysis of CuSO_4 solutions at 100° C. and their precipitation by alkalis and by NiO , Ni(OH)_2 , and NiCO_3 showed only two basic sulphates, $4\text{CuO} \cdot \text{SO}_3 \cdot 4\text{H}_2\text{O}$ or $[\text{Cu}\{\text{Cu(OH)}_2\}_3]\text{SO}_4 \cdot \text{H}_2\text{O}$, langite, and $3\text{CuO} \cdot \text{SO}_3 \cdot 2\text{H}_2\text{O}$ or $[\text{Cu}\{\text{Cu(OH)}_2\}_2]\text{SO}_4$, antlerite. Brochantite, $4\text{CuO} \cdot \text{SO}_3 \cdot 3\text{H}_2\text{O}$, is formed by loss of water from langite at 150° C. in air. Gentle ignition of CuSO_4 (650° C.) gives $2\text{CuO} \cdot \text{SO}_3$ (dolerophanite), which gives langite with cold, and antlerite with hot, water. The identity of the artificial products with natural minerals was checked by X-ray powder photographs (except for dolerophanite), which also showed the identity of atacamite with Brunswick green; but langite and brochantite have identical powder photographs. M. H. F.

NILEY (J. E.), GABRIEL (Alton), & PARTRIDGE (Everett P.). *Equilibria in the system potassium sulfate-magnesium sulfate-calcium sulfate-water at 100° C.* Journ. Physical Chem., 1938, vol. 42, pp. 587-616, 8 figs.

Stable and metastable equilibria in the system K_2SO_4 - $CaSO_4$ - H_2O are studied, and the existence fields of polyhalite, syngenite, anhydrite, and gypsum (metastable) and of the salt $K_2SO_4 \cdot 5CaSO_4 \cdot H_2O$ defined.

M. H. H.

ILL (Arthur E.) & WILLS (John H.). *Ternary systems. XXIV. Calcium sulfate, sodium sulfate and water.* Journ. Amer. Chem. Soc., 1938, vol. 60, pp. 1647-1655, 5 figs.

The system Na_2SO_4 - $CaSO_4$ - H_2O has been studied at 25°, 35°, 50°, and 75° C.; gypsum, anhydrite, mirabilite, thenardite, glauberite, $CaSO_4 \cdot 5CaSO_4 \cdot 3H_2O$, and $2Na_2SO_4 \cdot CaSO_4 \cdot 2H_2O$ were obtained as solid phases; optical data are given for the last two.

M. H. H.

WES (F. E.). *The quaternary system CaO - Al_2O_3 - $CaSO_4$ - H_2O at 25° C.* Trans. Faraday Soc., 1939, vol. 35, pp. 1484-1510, 13 figs.

An equilibrium study at 25° C. showed general agreement with previous results in respect of the three-component systems involved, but differences in detail; the boundary curves and invariant points of the four-component system have been determined; only one quaternary compound, $3CaO \cdot Al_2O_3 \cdot 3CaSO_4 \cdot 32H_2O$ [ettringite], occurs though $CaO \cdot Al_2O_3 \cdot CaSO_4 \cdot 12H_2O$ has been obtained at 100° C. The application of the results to the behaviour of sulphate-bearing Portland cement and the attack of sulphate waters on cement are considered.

M. H. H.

EMENT (R.). *Isomorpher Ersatz des Phosphors in Apatiten durch Silicium und Schwefel.* Naturwiss., 1939, vol. 27, pp. 57-58, 1 fig. A mixture, $3Ca_2SiO_4 + 3CaSO_4 + CaF_2$, sintered for some hours at 1000° gave artificial ellestadite, $Ca_{10}Si_3S_3O_{24}F_2$ [M.A. 7-14]. A mixture, $3Ca_2SiO_4 + Ca_3(PO_4)_2 + CaSO_4 + CaF_2$, gave $Ca_{10}Si_2P_2S_2O_{24}F_2$. Both of these compounds gave X-ray patterns related to that of apatite.

L. J. S.

EMENT (R.). *Natrium-Calcium-sulfatapatit $Na_6Ca_4(SO_4)_6F_2$.* Naturwiss., 1939, vol. 27, p. 568.

A mixture of $3Na_2SO_4$, $3CaSO_4$, and $1CaF_2$ fused at 800° gave the

X-ray pattern of apatite but with somewhat larger cell dimensions $a\ 9.51_5$, $c\ 7.01_5$. A mixed apatite of the composition $\text{Na}_4\text{Ca}_6(\text{PO}_4)_2(\text{SO}_4)_2$ was obtained by fusing the appropriate mixture. L. J. S.

FOURETIER (Georges). *La précipitation du phosphate tricalcique et l'hydroxyapatite*. Compt. Rend. Acad. Sci. Paris, 1937, vol. 205, pp. 415, 1 fig.

The nature of the precipitate obtained on mixing lime-water and aqueous H_3PO_4 , and its ageing have been studied by X-ray and conductometric methods. The precipitate first formed is amorphous $\text{Ca}_3(\text{PO}_4)_2 \cdot x\text{H}_2\text{O}$, and is unstable, gradually transforming into hydroxyapatite; both solids adsorb Ca^{++} or PO_4^{--} readily. M. H. H.

FEIGELSON (I. B.), GRUSHVITSKY (V. E.), & KOROBOCHKINA (T. V.). *Synthesis of inderite*. Compt. Rend. (Doklady) Acad. Sci. USSR, 1939, vol. 22, pp. 242-243.

Acicular crystals with the composition $2\text{MgO} \cdot 0.3\text{B}_2\text{O}_3 \cdot 15\text{H}_2\text{O}$ are slowly deposited from a clear aqueous solution of borax and $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ at 35°C . They are orthorhombic with sp. gr. 1.78, $\beta\ 1.489$, $\gamma\ 1.505$, $2V\ 60^\circ$ positive, agreeing with inderite [M.A. 7-122, 123]. L. J. S.

NIKOLAIEV (A. V.) & SELIVANOVA (N. M.). *Synthesis of hydroboracite*. Compt. Rend. (Doklady) Acad. Sci. URSS, 1938, vol. 20, pp. 29-30, 1 fig.

Hydroboracite, hitherto regarded as a rare mineral, is abundant in the Inder borate deposits, Kazakhstan. It has not previously been prepared artificially. A solution of borax added to one of CaCl_2 and $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ and kept at 50°C . deposited after several days a crust of needles. The needles contained $\text{B}_2\text{O}_3\ 50.88$, $\text{CaO}\ 12.82$, $\text{MgO}\ 9.48$, $\text{H}_2\text{O}\ 26.82$, and X-ray photographs showed the same lines as the native mineral; $\alpha\ 1.534$, $\beta\ 1.534$, $\gamma\ 1.571$. L. J. S.

JANDER (Wilhelm) & PETRI (Josef). *Die Bildung von Anorthit und Gehlenit durch Reaktion im festen Zustande*. (20. Mitteilung über Reaktionen im festen Zustande bei höheren Temperaturen). Zeitschrift für Elektrochem., 1938, vol. 44, pp. 747-754, 8 figs.

Anorthite and gehlenite may be synthesized by reactions in the solid state between CaO , Al_2O_3 , and SiO_2 , or between calcium silicates, aluminates and the necessary simpler compounds. The finely powdered materials were heated at $1050-1100^\circ$ in a gas muffle furnace. The cooling

the reactions was followed by X-ray powder photographs; gehlenite formed as an intermediate step in the anorthite synthesis, except perhaps when kaolin is used as starting material. M. H. H.

THEL-LÉVY (Albert) & WYART (Jean). *Synthèse de l'anorthite par pneumatolyse à l'aide d'explosifs brisants*. Compt. Rend. Acad. Sci. Paris, 1939, vol. 208, pp. 1030-1033, 2 figs.

A mixture of precipitated SiO_2 , Al_2O_3 , and CaCO_3 with hexogene was contained in a closed vessel in an atmosphere of argon, and then maintained for 4-7 days at $510-560^\circ$. The contents of the vessel when opened showed white crystalline crusts containing many spherulites, which X-ray diffraction and the optical properties showed to be anorthite with a little calcite. C. A. S.

THEL-LÉVY (Albert) & WYART (Jean). *Néogénèse de minéraux au cœur des roches par recuit dans des gaz et vapeur d'eau sous hautes pressions. Production de phénomènes de métamorphisme artificiel*. Compt. Rend. Acad. Sci. Paris, 1939, vol. 209, pp. 175-177, 2 figs.

Prisms $2 \times 6 \times 6$ mm. of (I) coarsely crystalline chlorite-schist containing much clinochlore and haematite, (II) fine-grained calciferous schist, and (III) a Paris basin clay containing much colloidal matter, were subjected to pressures of 3000-4000 kg. per sq. cm. by being placed in a bomb with an explosive (but so that they were not acted upon by the gases produced on detonation), with addition of H_2O , and with or without KOH or NaOH. After detonation the bomb was heated for 2 days at 600° before opening. With I, white mica, spinel, and probably corundum had been formed; with II, sericite, while the calcite was replaced by undetermined crystals and the walls of the bomb were coated with anorthite and amphibole; with III, halloysite had been converted into sericite with other undetermined changes, and plasticity was replaced by brittleness. The vapours of H_2O , &c., had thus penetrated the solid rocks. [M.A. 7-282.] C. A. S.

GORIEV (D. P.). *Experimental investigation on the effect of alumina on the optical properties of tremolite*. Compt. Rend. (Doklady) Acad. Sci. URSS, 1939, vol. 23, pp. 71-73, 1 fig.

Fluor-tremolite was prepared by fusing SiO_2 , MgO , and CaF_2 (M.A. 7-141], together with varying amounts of Al_2O_3 , in a carbon crucible at 1400° and cooling for 3-4 hours. Prismatic crystals up to 0.5 mm. long, with (110) faces and (110) cleavage, and radial aggregates

were obtained. With $< 1\%$ Al_2O_3 the product was not all tremolite and with $> 10\%$ Al_2O_3 none was formed. Partial analysis of melt no. 1 showed 9.03 % F.

Melt.	Al_2O_3 %.	α .	γ .	$\gamma - \alpha$.	$\gamma : c$.
1 ...	1.0	1.584	1.606	0.022	$23\frac{1}{2}^\circ$
2 ...	2.9	1.584	1.606	0.022	$23\frac{1}{2}^\circ$
3 ...	4.8	1.579	1.600	0.021	$21\frac{1}{2}^\circ$
4 ...	9.1	1.573	1.594	0.021	$20\frac{1}{2}^\circ$

L. J. S.

GRIGORJEV (D. P.) & SHAFRANOVSKY (I. I.). *A crystallographic investigation of artificial mullite*. Compt. Rend. (Doklady) Acad. Sci. URSS, 1939, vol. 23, pp. 933-934, 1 fig.

Pale grey acicular crystals (2-3 mm. long) from a cavity in a mullite brick show the forms m c with narrow a b ; mm $89^\circ 8'$; α 1.644 (= c) 1.657.

L. J. S.

EITEL (W.). *Der heutige Stand des Sillimanit-Mullit-Problems*. Festschrift zum 50. Geburtstag von Prof. Dr. H. J. Goldschmidt, Deutsch. Keram. Gesell., 1937, vol. 18, pp. 2-11, 3 figs.

A review.

M. H. H.

HOLLAND (A. J.) & PRESTON (Eric). *The microscopical examination and identification of crystalline products in commercial glasses*. [Part I. Journ. Soc. Glass Techn. 1937, vol. 21, pp. 395-408, 24 pls. 1 text-fig. Part II. Ibid., 1938, vol. 22, pp. 82-98, 16 pls., 2 text-figs.]

This paper is of great value to petrologists as it gives a very good description of many rock-forming minerals, such as quartz, cristobalite, tridymite, wollastonite, mullite, sillimanite, diopside, corundum, &c., as seen under the microscope. Forty plates, containing excellent photomicrographs (some in colour) of crystalline products found in commercial glasses, are a valuable part of this paper. The formation of crystals in commercial glasses is also discussed.

S. I. T.

McMURDIE (Howard F.) & BUNTING (Elmer N.). *X-ray studies of compounds in the system PbO-SiO_2* . Journ. Research National Bureau of Standards, U.S.A., 1939, vol. 23, pp. 543-547.

X-ray powder photographs of artificial lead silicate melts show that three compounds exist, PbO.SiO_2 (identical with the mineral alamosite), 2PbO.SiO_2 , and 4PbO.SiO_2 , the last occurring in at least two polymorphic forms.

F. A. E.

NER (John W.). *Ammonium mica synthesized from vermiculite*. Amer. Min., 1939, vol. 24, pp. 428-433.

Prolonged treatment of analysed samples of vermiculite with hydrogen peroxide and ammonia produces ammonium-mica. The transformation is checked by X-ray, chemical, and optical data. The ammonium is not expelled by heating the products at 300° C., but at 650° C. transformation to talc ensues. It is suggested that the double layers of water molecules supposed by Hendricks and Jefferson [M.A. 7-397] to exist in vermiculite contain (H₃O) groups which might account for the replacement of the water layers by ammonium layers. F. A. B.

NER (John W.). *Formation and stability of muscovite in acid solutions at elevated temperatures*. Amer. Min., 1939, vol. 24, pp. 624-628.

Describes experiments on the formation and stability of muscovite in HCl solutions in gold-lined steel bombs in an atmosphere of carbon dioxide. At 300° C. the mineral changes to kaolinite provided the amount of HCl stays below a certain limit. Excess of HCl at this temperature prevents the decomposition of muscovite. However, kaolinite in acid solutions and excess of HCl does not change to muscovite until the temperature is raised to 400° C. At this temperature muscovite will form in HCl solution from aluminium hydroxide, silica, and HCl. F. A. B.

ERTON (F. H.). *Hydrothermal formation of clay minerals in the laboratory*. Amer. Min., 1939, vol. 24, pp. 1-17, 6 figs.

X-ray photographs, dehydration curves, and partial chemical analyses are used to identify the chief products of reaction between finely ground natural aluminosilicates and CO₂-charged water at various temperatures and pressures. Below 250° C. and above 350° C. no reactions were observed. The optimum temperature of reaction is 250° C. and the conversion in 320 hours varies from 25 to 100 % for different minerals. The conversions obtained were albite → beidellite; nepheline → sericite (275° or 325° C.); nepheline → gibbsite (300° C.); clinoclase → sericite; leucite → sericite; petalite → kaolinite; spodumene → kaolinite; anorthite → pyrophyllite; and lepidolite, beryl, leucite, and kaolinite, no change. F. A. B.

ENES (Dieter). *Über den Mineralbestand der sauren Hochofenschlacken*. Zentr. Min., Abt. A, 1939, pp. 257-271, 4 figs.

An acid slag from the smelting of low-grade iron ore consists of

anorthite (40 %), clinopyroxene, melilite, leucite, and undetermined acicular crystals. L. J. S.

NISIOKA (Usaburô). *The equilibrium diagram of the system $\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ — $\text{CaO} \cdot \text{TiO}_2$* . Sci. Rep. Tôhoku Univ., Ser. 1, 19 vol. 24, pp. 707–713, 6 figs.

— *The equilibrium diagram of the system $\text{CaO} \cdot \text{MgO} \cdot 2\text{SiO}_2$ — $\text{CaO} \cdot \text{TiO}_2$* . Ibid., pp. 714–718, 5 figs.

The system anorthite-perovskite shows a simple eutectic at 1350° and 35 % perovskite. Mixtures of gehlenite and sphene heated at 1400 to 1490° C. reacted to give gehlenite, perovskite, and glass. Mixtures of gehlenite and perovskite show no fusion at 1460–1480° C. The system diopside-perovskite shows a simple eutectic at 1270° C. and 32 % perovskite. M. H. H.

HAY (R.), WHITE (James), & CAULFIELD (Thomas H.). *The ternary system FeO — Al_2O_3 — SiO_2* . Journ. Soc. Glass Techn., 1937, vol. 20, pp. 270–280, 1 pl., 6 text-figs.

This is a thermal study of the system FeO — Al_2O_3 — SiO_2 , together with the microscopical study of the crystalline phases obtained, which include spinel, fayalite, mullite, and silica. S. I. T.

Chemical Crystallography.

PORTER (M. W.) & SPILLER (R. C.). *Crystallo-chemical analysis. The Barker index at Oxford*. Nature, London, 1939, vol. 144, pp. 293–299.

An account is given of the determinative tables planned by the late T. V. Barker (1881–1931). The work of compilation is still in progress. [M.A. 4–337, 5–197, 6–78–80, 7–167.] L. J. S.

BLOOM (Mortimer C.). *The mechanism of the genesis of polymorphic forms*. Amer. Min., 1939, vol. 24, pp. 281–292, 4 figs.

Although orthorhombic valentinite is the form of antimony trioxide stable above 570° C. and can be shown to be more soluble in water at room-temperatures than the cubic form senarmontite, it is the form predominant in precipitation from 0.01N-HCl and 0.01N-H₂SO₄, whereas senarmontite predominates in precipitation from 0.01N-HClO₄. The stable group Sb₄O₆ is first broken down in the presence of sufficient hydrogen ions to form SbOOH which loses water to give the SbO character present in valentinite. This structure is only formed, however, in

second condition is fulfilled, that the anion also present during precipitation shall fit into the interstitial holes of the valentinite structure. When, for example, the ClO_4 ion of perchloric acid is too large to fit, then the more close-packed structure senarmontite predominates, unless the hydrogen-ion content is increased to such a degree that no Sb_4O_6 groups necessary for the formation of the senarmontite phase can exist.

F. A. B.

ŌJI (Hikoroku). *On the change of lattice-orientation due to allotropic transformation in boracite, leucite, and anhydrous sodium sulphate crystals.* Sci. Rep. Tôhoku Univ., Ser. 1, 1937, vol. 26, pp. 86–92, 6 figs.

It frequently occurs that in a polymorphic transformation one or more important lattice planes of the new structure are parallel to important planes of the old one. From X-ray studies and general considerations, it is concluded that in the cases of boracite and leucite it is one of the pseudo-(110) planes of the low-temperature form that becomes the (110) plane of the cubic crystal, and vice versa, while in the case of Na_2SO_4 the pseudo-(0001) planes of the low- and high-temperature forms correspond.

M. H. H.

VERMANS (J.). *Un nouvel état mésomorphe. Les cristaux organiques plastiques.* Journ. Chim. Physique, 1938, vol. 35, pp. 331–344, 1 fig.

Organic compounds having a low entropy of fusion frequently show one, or all, of the following properties: high specific heat; high dielectric constant; a polymorphic transformation with marked absorption of heat on cooling; marked plasticity of the crystals; a great tendency to the formation of mixed crystals, even between optical antipodes or unresolvable substances; a higher melting-point than similarly constituted compounds with normal entropy of fusion; a tendency to sublime readily without melting; a marked change of melting-point with pressure; cubic or pseudo-cubic crystallization; a camphoraceous odour. Some of these compounds (e.g. CH_4 , CCl_4 , $\text{C}(\text{CH}_3)_4$) have highly symmetrical molecules, others are probably rotating in the high-temperature crystalline form.

M. H. H.

ÖGER (F. A.). *Note on the wurtzite-sphalerite transition of zincsulphide.* Zeits. Krist., 1939, vol. 102, pp. 136–137.

It has been shown for metals that a polymorphous change at a given

temperature takes place much more slowly for polycrystalline material than for single crystals. Similarly, it has been found that finely crystalline artificial wurtzite needs thirty hours at 900° C. for complete transformation to the zinc-blende form, whereas the transition takes place in a single crystal within three hours.

F. A. B.

KRÖGER (F. A.). *Formation of solid solutions in the system zincsulfide-manganesesulfide*. Zeits. Krist., 1939, vol. 100, pp. 543-545, 1 fig.

Mixed crystals of ZnS and MnS were obtained by heating a mixture of the two substances in KCl at a temperature of 1180° C. containing molecular percentages of MnS up to 52%. The mixed crystals were of the wurtzite or zinc-blende type, according to the temperature of formation when the manganese content was low. When a high percentage of manganese was present, the crystals were always of the wurtzite type.

H. S.

KRÖGER (F. A.). *Solid solutions in the ternary system ZnS-CdS-MnS*. Zeits. Krist., 1939, vol. 102, pp. 132-135, 1 fig.

The ternary phase relations of the system ZnS-CdS-MnS have been worked out at 900° C. All mixtures containing less than 48 mol. % of the manganese component yielded a homogeneous product possessing the wurtzite structure; products with high ZnS content showed the zinc-blende structure. Mixtures containing more than 48 mol. % of MnS gave rise to red mixed crystals ZnS-CdS-MnS with the wurtzite structure and green MnS with the rock-salt structure. Mixed crystal formation in this instance is shown to depend more upon whether the bonding is predominantly homopolar or ionic than upon the close approach of lattice dimensions.

F. A. B.

BUERGER (Newton W.). *The polymorphism of Cu₂S, and the relations between the solid phases of the system Cu₂S-CuS*. Journ. Chem. Physics (Amer. Inst. Physics), 1939, vol. 7, pp. 1067-1068, 1 fig.

The equilibrium diagram of the system Cu₂S-CuS shows three compounds and six phases. The compounds are: (1) chalcocine, Cu₂S; (2) digenite, 4Cu₂S.CuS = Cu₉S [digenite of A. Breithaupt, 1844, has been regarded as a mixture of (1) and (3)]; (3) covellite, CuS. As shown by X-ray photographs taken at different temperatures, chalcocine undergoes three reversible transformations (the change to a cubic form at 91° [M.A. 2-506, 4-231] is not confirmed): stable below 51°, orthorhombic between 51° and 119°, and cubic above 119°.

rhombic superstructure; 52–78°, non-cubic ordered basic structure; 78–105°, non-cubic partly disordered basic structure; above 105°, non-cubic completely disordered basic structure. The compound Cu_9S_5 , with a powder pattern identical with that of digenite, has the ideal composition below 47°, but above this temperature it takes up Cu_2S or CuS .

L. J. S.

SWAT (D. D.). *The thermal diagram for the system:—FeS–Cu₂S. With a note on the determination of the dissociation pressures of iron sulphides.* Journ. Roy. Techn. Coll. Glasgow, 1936, vol. 3, p. 587.

The system shows a eutectic, with no compound formation, but considerable reciprocal solubility. Preliminary work has been done on the dissociation pressure of pyrrhotine near 1100° C.

M. H. H.

KURNAKOV (N. N.) & БОКУ (G. B.)] Курнаков (Н. Н.) и Бокий (Г. Б.). О кристаллах ферросилиция.—KURNAKOFF (N. N.) & БОКУ (G. B.). *On the crystals of ferro-silicon.* Изв. Акад. Наук СССР, Отд. Мат. Ест., Сер. Хим. (Bull. Acad. Sci. URSS, Cl. Sci. Mat. Nat., Sér. Chim.), 1938, pp. 919–924, 7 figs. (Russian with English summary).

An equilibrium diagram is given for the system Fe–Si. Three types of crystals are described: tetragonal plates with 53.5–54.80 % Si; trigonal plates with 45–47 % Si; and trigonal plates with up to 87 % Si. The two latter appear to be metastable phases. [Min. Mag. 24–164.] L. J. S.

MENHEUER (Peter) & BRAUNS (ERWIN). *Die Gleichgewichte zwischen Eisen und Nickel und ihren an Kieselsäure gesättigten Silikaten.* Mitt. Kais.-Wilh. Inst. Eisenforsch. Düsseldorf, 1935, vol. 17, pp. 127–132, 6 figs.

A more detailed study of this system confirmed and extended previous results [M.A. 5–8, 153; 6–100]. The crystalline, silica-saturated slag varies in composition from slightly more siliceous than FeSiO_3 to rather more siliceous than NiSiO_3 , and contains appreciable amounts (up to 10 %) of Fe_2O_3 . The metal contains appreciable amounts of oxide, up to 0.1 % oxygen in iron-rich, and about $\frac{1}{2}$ % in nickel-rich, alloys.

M. H. H.

FRANZ) & LANGE (Heinrich). *Ueber den Ablauf der Umwandlungen bei den irreversiblen Eisen-Nickel-Legierungen.* Mitt. Kais.-Wilh. Inst. Eisenforsch. Düsseldorf, 1936, vol. 18, pp. 217–225, 17 figs.

A study of the reactions in the Fe–Ni system on rapid heating and

cooling was made by a magnetic method. In the $\gamma \rightarrow \alpha$ reaction, there is change in composition of the reacting phases [!], but in the $\alpha \rightarrow \gamma$ reaction there is a change. An alloy with 24.9 % Ni formed a face-centred γ' -phase with a 3.64 Å. from 500° to 375° C. The behaviour of this system is compared to the formation of martensite in steel. M. H. H.

MARQUES (*M^{me} Branca-Edmée*). *Contribution a [sic] l'étude du fractionnement des sels de baryum radifère*. Journ. Chim. Physique, 1936, vol. 33, pp. 1-40, 8 figs.

— *Distribution du radium dans les cristaux des sels de baryum radifère*. Ibid., pp. 219-225, 1 pl., 1 text-fig.

The crystallization of isomorphous mixtures of radium and barium salts was studied in detail. The crystals always contain radium, although the solubility of the radium salt is not approached. The ratio barium/radium in the material being deposited at any moment is proportional to the ratio in the solution; for all the salts studied the proportionality factor varied with the rate of crystallization, the temperature, and the salt to salt. For $(\text{Ba,Ra})\text{CO}_3$ the factor was less than unity, but for $(\text{Ba,Ra})(\text{NO}_3)_2$, $(\text{Ba,Ra})\text{SO}_4$, $(\text{Ba,Ra})\text{Cl}_2$, and $(\text{Ba,Ra})\text{Br}_2$ it was greater than unity; hence for these last salts the proportion of radium in the crystals should, and does, diminish from the centre outwards. The proportionality factor approaches a constant value as the rate of crystallization is increased.

M. H. H.

BELLANCA (Angelo). *Proprietà fisiche dei cristalli misti*. Periodico Mineralogico, Roma, 1939, vol. 10, pp. 9-20, 3 figs.; pp. 253-257, 2 figs.

The molecular and weight compositions of mixed crystals KCl-KBr, NaCl-NaBr, NaBr-KBr, and KCl-RbCl plotted against the specific gravity and specific volume do not show a strictly linear relation required by Retger's rule.

L. J. J.

BELLANCA (Angelo). *Proprietà fisiche dei cristalli misti*. Nota Mineralogica, Periodico Min. Roma, 1939, vol. 10, pp. 405-416, 4 figs.

Refractive indices plotted against percentage composition in the systems KCl-RbCl, KCl-KBr, and NaCl-NaBr show curves differing slightly from a linear relation. Values for the end-members are:

			NaCl.	KCl.	RbCl.	NaBr.	KBr.
n_D	...	...	1.5443	1.4904	1.4936	1.6440	1.5595
d_4^{20}	...	...	2.1698	1.9971	2.7731	3.1790	2.7354

L. J. J.

TELAAR (J. A. A.) & WILLEMS (P. J. H.). *Anomale Mischkrystalle im System $\text{SrF}_2\text{--LaF}_3$* . Rec. Trav. Chim. Pays-Bas, 1937, vol. 56, pp. 29–35, 2 figs.

Mixed crystals of SrF_2 and LaF_3 were obtained containing up to mol. % of LaF_3 , by fusion of mixtures of $\text{Sr}(\text{NO}_3)_2$ and $\text{La}(\text{NO}_3)_3$ with HF_2 . Density determinations show that the mixed crystals have not perfect lattice, but instead the extra fluorine atoms are accommodated in the interstices of the CaF_2 structure. M. H. H.

ERISER (Harry B.), MILLIGAN (W. O.), & EKHOLM (W. C.). *The mechanism of the dehydration of calcium sulfate hemihydrate*. Journ. Amer. Chem. Soc., 1936, vol. 58, pp. 1261–1265, 5 figs.

X-ray photographs of calcium sulphate hemihydrate and dehydrated material differ appreciably. This, together with a sharp step-form dehydration curve, indicates that the hydrate is normal, not zeolitic; the anhydrous compound evidently has a very similar structure to the hydrate. M. H. H.

ANNES (Jean). *Sur l'eau de cristallisation du gypse*. Compt. Rend. Acad. Sci. Paris, 1938, vol. 207, pp. 700–702.

A study of the intensities and polarization of the Raman spectrum of gypsum with various directions of the incident and scattered light shows marked anisotropy. The bands due to the two modes of vibration of the water molecule can be observed separately. The water molecules are isolated, and their vibrations are similar to those they exhibit in the vapour rather than in the liquid. M. H. H.

CON (J.). *Forme cristalline et propriétés optiques de l'iodate calcique*. Bull. Soc. Franç. Min., 1935 [i.e. 1936], vol. 58 (for 1935), pp. 343–349, 1 fig.

$\text{Ca}(\text{IO}_4)_2 \cdot 6\text{H}_2\text{O}$ has been described as dimorphous in two orthorhombic forms, but by an interchange of axes the axial ratios are the same. The data of A. S. Eakle (1896) are accepted— $a:b:c = 0.6465:1:0.2768$. The axial plane (100), $\text{Bx}_a \perp (001)$, $2V$ large, positive, $\alpha 1.604$, $\beta 1.644$, $\gamma 1.6386$. L. J. S.

ODLING (F. M.) & MELLOR (D. P.). *The double refraction of $\text{BaCdCl}_4 \cdot 4\text{H}_2\text{O}$* . Zeits. Krist., 1939, vol. 102, p. 146.

New values of the refractive indices of $\text{BaCdCl}_4 \cdot 4\text{H}_2\text{O}$ are $\alpha 1.610$, $\beta 1.646$, $\gamma 1.653$, all ± 0.003 for sodium-light. F. A. B.

PEACOCK (M. A.) & VIGFUSSON (V. A.). *Calcium diborate hexahydrate from a mortar of Portland cement and colemanite*. Univ. Toronto Studies, Geol. Ser., 1939, no. 42, pp. 113–121, 3 figs.

Mortar briquettes prepared from one part of Portland cement and four parts of colemanite and stored for fourteen months in distilled water developed large tabular crystals, sp.gr. 1.881–1.884, close to the formula $\text{CaO} \cdot \text{B}_2\text{O}_3 \cdot 6\text{H}_2\text{O}$. Goniometric, optical, and X-ray data are: axial ratio $a:b:c = 1.2058:1:1.2063$, β $75^\circ 49'$; forms, $c(001)$ (parallel to a good cleavage), $b(010)$, $a(100)$, $m(110)$, $d(011)$, $e(021)$, $f(\bar{2}01)$, $p(111)$, $q(\bar{1}11)$, $r(\bar{1}12)$; α 1.506, β 1.511, γ 1.514, $2V$ $76 \pm 5^\circ$, $\alpha = b$, $\gamma:c = 3^\circ$; a 7.9, b 6.614, c 7.977 Å., β $75^\circ 35'$; the unit cell contains $\text{Ca}_2\text{B}_4\text{O}_8 \cdot 12\text{H}_2\text{O}$ and the space-group is $C_s^2 = Pa$.

F. A. B.

TOROPOV (N. A.). *Crystallo-optical analysis of strontium aluminates*. Compt. Rend. (Doklady) Acad. Sci. URSS, 1939, vol. 1, pp. 74–75.

The following compounds were obtained by fusing mixtures of SrCO_3 and Al_2O_3 . $3\text{SrO} \cdot \text{Al}_2\text{O}_3$ as cubic trapezohedra, n 1.728. $\text{SrO} \cdot \text{Al}_2\text{O}_3$ as prismatic crystals with a perfect cleavage in one direction and pseudohexagonal twinning, α 1.649, γ 1.663. $\text{SrO} \cdot 2\text{Al}_2\text{O}_3$, prismatic crystals with extinction-angle up to 45° , $2V$ large, positive, α 1.614, γ 1.616. $\text{SrO} \cdot 6\text{Al}_2\text{O}_3$, uniaxial with perfect basal cleavage, ω 1.702, ϵ 1.616. These are compared with corresponding aluminates of calcium and barium, and the last with magnetoplumbite [M.A. 7–391].

L. J. S.

BROWMAN (Audra A.) & HASTINGS (A. Baird). *Solubility of aragonite in salt solutions*. Journ. Biol. Chem. Baltimore, 1937, vol. 1, pp. 241–246.

The solubility of aragonite has been determined in solutions of Na_2CO_3 of various strengths and containing small amounts of Na_2CO_3 .

M. H. H.

MEHMET (Rüştü) & VALENSI (Gabriel). *Sur la dissociation de la smectonite*. Bull. Soc. Chim. France, 1935, ser. 5, vol. 2, pp. 1295–1300, 4 figs.

It was found impossible to attain true equilibria in the system $\text{ZnCO}_3 \rightleftharpoons \text{ZnO} + \text{CO}_2$. No evidence of solubility of ZnO in ZnCO_3 solution was obtained.

M. H. H.

CONI (M.) & FERRARIO (A.). *Azione dell'acqua ricca di anidride carbonica sulla dolomite*. Periodico Min., 1939, vol. 10, pp. 397-404.
 Water saturated with CO_2 dissolves more CaCO_3 than MgCO_3 from
 omite. L. J. S.

X-rays and Crystal-structure.

KHEEV (V. I.) & DUBININA (V. N.)] Михеев (В. И.) и Дубинина
 (В. Н.). Рентгенометрический определитель минералов. Часть
 II.—MIKHNEEV (V. I.) and DUBININA (V. N.). *X-ray determinative
 tables of minerals. Part II*. Зап. Ленинград. Горн. Инст. (Ann.
 Inst. Mines Léningrad), 1939, vol. 13, pt. 1, pp. 1-135.
 A continuation of the index of X-ray powder photographs of minerals
 A. 7-226]. The alphabetical indexes of names, in Russian and
 English, include the 146 minerals in Part II, together with 142 previously
 en in Part I. L. J. S.

KHEEV (V. I.) & DUBININA (V. N.)] Михеев (В. И.) и Дубинина
 (В. Н.). Эталонные порошкограммы некоторых минералов из
 класса окислов.—MIKHNEEV (V. I.) and DUBININA (V. N.). *Standard
 powder-diagrams of some minerals of the class of oxides*. Зап.
 Ленинград. Горн. Инст. (Ann. Inst. Mines Léningrad), 1939,
 vol. 12, pt. 1, pp. 151-167, 26 figs.

The lines of X-ray powder photographs of the following minerals are
 rded on the same plan as in the index noticed in the preceding
 ract. Cassiterite, thorite, ilmenorutile, polianite, pyrolusite, uran-
 e, thorianite, arsenolite, claudetite, senarmontite, and antimony
 te. L. J. S.

KHEEV (V. I.)] Михеев (В. И.). Эталонные дебаграммы мине-
 ралов каменного литья.—MIKHNEEV (W. I.). *Debaysche Etalondia-
 gramme von Mineralien der Steingiesserei*. Зап. Ленинград. Горн.
 Инст. (Ann. Inst. Mines Léningrad), 1939, vol. 12, pt. 1, pp. 1-93,
 38 figs. (Russian with German summary.)

DUBININA (V. N.)] Дубинина (В. Н.). Рентгенометрическое иссле-
 дование некоторых эталонных минералов и продуктов плавки
 каменного литья.—DUBININA (V. N.). *X-ray examination of some
 standard minerals and products of melted rocks*. Ibid., pp. 95-142,
 33 figs. (Russian with English summary.)

X-ray powder photographs of standard (analysed) minerals, including
 el, magnetite, haematite, olivine, diopside, augite, hypersthene,

wollastonite, albite, labradorite, and anorthite, are used for reference in the identification of minerals present in fused (cast) rocks [M. 416, 417; 7-297]. By this X-ray method some minerals were identified which were not evident by optical methods. L. J. S.

AGAFONOVA (T. N.). *Quantitative mineralogical X-ray analysis*. Compt. Rend. (Doklady) Acad. Sci. URSS, 1937, vol. 16, pp. 369-371, 369, 3 figs.

Quantitative determination of minerals in certain mixtures is made by means of the relative intensities of lines of X-ray powder spectra. S. I. T.

FERSMAN (A. E.). *On the tetrahedral structure of minerals*. Compt. Rend. (Doklady) Acad. Sci. URSS, 1938, vol. 18, pp. 449-452.

The abundance of the tetrahedral complex anions of the type $Si_3O_8^{4-}$ among the minerals is noted and certain geochemical deductions are made. S. I. T.

PEACOCK (M. A.). *X-rays in mineralogy: design of a serviceable apparatus*. Univ. Toronto Studies, Geol. Ser., 1939, no. 42, pp. 79-93, 3 figs.

A description of X-ray apparatus recently installed in the Department of Mineralogy, University of Toronto. Two robust, demountable stainless steel and pyrex glass X-ray gas tubes supply monochromatized radiation to Weissenberg and powder cameras. F. A. J.

TUNELL (George). *The rotation factor for equi-inclination Weissenberg photographs*. Amer. Min., 1939, vol. 24, pp. 448-451, 2 figs.

Reproduces curves giving the Cox-Shaw intensity correction factor for X-ray diffractions on equi-inclination Weissenberg photographs [M.A. 4-266.] F. A. J.

LAVAL (Jean). *Étude expérimentale de la diffusion des rayons X par les cristaux*. Bull. Soc. Franç. Min., 1939, vol. 62, pp. 137-253, 55 figs.

An apparatus utilizing a thin curved quartz plate is described for irradiating crystals with truly monochromatic beams of X-rays. The absolute intensities of X-rays scattered in the region of the strong diffractions (002), (004), and (006) of sylvine are measured and are found to increase with increasing temperature. These regions are more extended for sylvine than for diamond owing to the greater thermal expansion.

tions of the K and Cl ions. A knowledge of the topography of the scattering domains near prominent X-ray diffractions should yield the energy distribution of the elastic waves constituting the thermal motions of the atoms or ions of a crystal-structure. F. A. B.

HOFMANN (Ulrich) & WILM (Diederich). *Über die Kristallstruktur von Kohlenstoff*. Zeits. Elektrochem., 1936; vol. 42, pp. 504–522, 13 figs.

X-ray powder photographs of active charcoal and other finely divided forms of carbon differ appreciably from those of graphite. The differences are considered in detail, and interpreted as due to random stacking of regular hexagonal lattice sheets. The degree of randomness in the stacking varies continuously from a very high value in active charcoal to very slight in graphite. In the charring of organic materials, graphitoid substances are formed before all the elements other than carbon have been expelled. The growth of the crystals in a charcoal, which begins about 1000° C., takes place mainly along the *c*-axis. On burning, attack takes place both perpendicular and parallel to the *c*-axis. A new determination of the cell sides of graphite gave a 4.252, c 6.69 Å. [Cf. M.A. 7–397.]

M. H. H.

LEL (René) & HOCART (Raymond). *Sur la laurite, CuAsS*. Compt. Rend. Acad. Sci. Paris, 1939, vol. 209, pp. 444–445.

Laurite associated with arsenic, tetrahedrite, chloanthite, rammelsbergite, löllingite, proustite, and xanthoconite is found in the Gabe mines mine at Sainte-Marie-aux-Mines (Haut-Rhin). It forms bunches of crystals up to 6 cm. $\times$ 6–7 mm., showing a brilliant (001) cleavage, enclosed in native arsenic. It is orthorhombic with a 3.78, b 5.47, c 11.47 Å, and 4CuAsS in the unit cell.

C. A. S.

HILLER (J. E.) & HOFMANN (Wilhelm). *Nachtrag zu der Arbeit von J. E. Hiller: "Röntgenographische Bestimmungsmethoden und Untersuchung der Bleispiessglanze."* Zeits. Krist., 1939, vol. 102, pp. 143–144. [M.A. 7–231.]

W. Hofmann has already found that the crystal-structures of stibnite and chalcostibite are based upon pyramidal chains of antimony and sulphur atoms parallel to the needle axis 3.83 Å. It is now suggested that the slightly higher value of the needle-axis spacing of the lead-antimony-sulphur minerals of about 4 Å. may be related to the presence of octahedral lead and sulphur chains in their crystal-structures.

F. A. B.

BERRY (L. G.). *Studies of mineral sulpho-salts: I—Cosalite from Canada and Sweden*. Univ. of Toronto Studies, Geol. Ser., 1939, no. 1, pp. 23–31.

Cosalite from McElroy township, Timiskaming district, Ontario, previously studied by T. L. Walker and analysed by E. W. Todd [M.A. 1–293] is orthorhombic, a 19.05, b 23.82, c 4.047 Å., space-group $D_{2h}^{16} = Pbnm$ or $C_{2v}^9 = Pbn(2)$. Flink's forms (001), (100), (010) become in the new setting (100), (010), (001) respectively. The unit cell of cosalite contains $8[(Pb,Cu)_2Bi_2S_5]$. Specimens of this mineral from Nordmark in Sweden, Ontario, and British Columbia [M.A. 7–509] give identical powder photographs, which are reproduced. F. A. B.

BRADISTILOV (G.). *Zur Berechnung der elektrostatischen Potentiale im Fluoritgitter*. Zeits. Krist., 1939, vol. 102, pp. 26–46.

STRANSKI (I. N.). *Notiz zur Arbeit von G. Bradistilov über die Berechnung der elektrostatischen Potentiale im Fluoritgitter*. Ibid., p. 47.

The electrostatic potentials for lattice points in layers of the fluorite structure parallel to (111) have been calculated, and the second part of the paper deals with application of the mathematical results to explain the predominance of the cubic form in specimens of the mineral. F. A. B.

PABST (Adolf). *Formula and structure of ralstonite*. Amer. Min., 1939, vol. 24, pp. 566–571, 3 figs. [M.A. 7–389.]

X-ray measurements on colourless octahedra of ralstonite from Ivigtut, Greenland, yield a 9.87 Å. for the edge of the unit cubic cell containing $16(Al,Mg)$, $2.8Na$, $48(F,OH)$, $7H_2O$. The probable space group is $O_h^- = Fd3m$, and the crystal-structure is of the type AB_2X_4 (pyrochlore). F. A. B.

ANDREß (K. R.) & SAFFE (O.). *Röntgenographische Untersuchung der Mischkristallreihe Karnallit-Bromkarnallit*. Zeits. Krist., 1939, vol. 101, pp. 451–469, 8 figs.

The unit-cell dimensions of carnallite have been redetermined as a 9.54, b 16.02, c 22.52 Å. Some weak diffractions have been observed which are consistent with the space-group $D_{2h}^{14} = Pban$. [M.A. 4–294.] The large size of the carnallite unit cell renders an exact crystal-structure determination difficult, but the artificially prepared series of mixed crystals $KMg(H_2O)_6(Cl,Br)_3$ containing 12.2 to 85 % Br are tetragonal and possess pseudo-cubic crystal-structures close to that of pyrochlore.

unit cell contains $4[\text{KMg}(\text{H}_2\text{O})_6(\text{Cl}, \text{Br})_3]$ and the space-group is $P4/n$.

Atomic % Br.	<i>a</i> .	<i>c</i> .	Sp.gr.
20	13.30 Å.	6.69 Å.	1.703
32	13.34	6.70	1.788
48	13.37	6.71	1.847
59	13.44	6.75	1.913
69	13.50	6.77	1.964
77	13.52	6.78	2.012

A discontinuity in the series exists at 67 % Br where the symmetry increases to $D_{4h}^7 - P4/nmm$. Cell dimensions and specific gravities are given for the closely related monoclinic salts $\text{KMg}(\text{H}_2\text{O})_6\text{Br}_3$, $\text{KMg}(\text{H}_2\text{O})_6\text{Cl}_3$, and $\text{NH}_4\text{Mg}(\text{H}_2\text{O})_6\text{Cl}_3$.
F. A. B.

ITO (T.) & SAWADA (H.). *The crystal structure of tellurite (TeO_2)*. Zeits. Krist., 1939, vol. 102, pp. 13–25, 9 figs.

The measurements of Ito have been extended to a Fourier synthesis of the data obtained by ionization spectrometer methods on large crystals of tellurite from the Rendaizi mine, Izu peninsula, Shizuoka Prefecture, Japan. The crystal-structure of tellurite closely resembles that of brookite, atoms of tellurium being enclosed within deformed tetrahedral oxygen groups. It is probable that the tellurium atoms share electrons, i.e. are linked by homopolar bonds. [M.A. 6-43, 174.]

F. A. B.

WILSON (R.) & SCHOON (Th.). *Zur Struktur des ferromagnetischen Eisen (III)-Oxyds $\gamma\text{-Fe}_2\text{O}_3$* . Zeits. Physikal. Chem., Abt. B, 1939, vol. 44, pp. 216–226, 2 figs.

Values obtained for the cell-side of $\gamma\text{-Fe}_2\text{O}_3$ prepared by different methods are: from Fe_3O_4 , a 8.316 Å.; from the iron arc, 8.333; from $(\text{CO})_5$, 8.3; in agreement with previous determinations. The questions of vacant spaces in the lattice and the space-group are considered. [M.A. 5-178; 6-175, 468; 7-86, 390, 403.]

L. J. S.

BERGSTRÖM (Lars Gunnar) & AURIVILLIUS (Bengt). *Oxide phases with a defect oxygen lattice*. Zeits. Krist., 1939, vol. 101, pp. 483–495, 5 figs.

Molten Bi_2O_3 kept for $\frac{1}{2}$ hour in a porcelain crucible takes up alumina and silica to form a simple cubic compound similar in crystal-structure to tetragonal $\beta\text{-Bi}_2\text{O}_3$ stable at higher temperatures. The specific

gravities and crystal-structures of melts of various proportions of lead and bismuth oxides and strontium and bismuth oxides have been prepared. The lead-bismuth oxide phase is tetragonal, space-group $D_{4h}^{7/4}$

Pb. %.	Sp.gr.	<i>a.</i>	<i>c.</i>	V.
33	9-33	4.05 Å.	4.90 Å.	80.6 Å ³ .
40	9-32	4.03	5.00	81.1
50	9-29	3.98	5.15	81.5
53	—	3.96	5.19	81.6
100	—	3.98	5.01	79.4

The strontium-bismuth oxide phase is rhombohedral, space-group $R\bar{3}m$

Sr %.	Sp.gr.	<i>a.</i>	<i>c.</i>	V.
14	—	3.97 Å.	28.06 Å.	383 Å ³ .
14.6	8-09	3.97	28.13	384
19.6	7-80	3.97	28.35	387
25	7.45	3.97	28.51	389
26	—	3.97	28.59	390

In both of these oxide phases the number of metal ions per unit cell is constant, two per unit cell for the lead-bismuth oxide phase and one for the strontium-bismuth oxide phase, whereas the number of oxygen ions is variable. It is proposed that the atomic arrangements can be derived from 'full structures' MeO_2 by removing a suitable number of oxygen atoms. In neither the lead-bismuth oxide nor the strontium-bismuth phase do the limits of the homogeneity range correspond to rational composition. In many lead and bismuth oxide phases the face-centred cubic lattice of the metal ions seems to be the stabilizing influence on the crystal-structure.

F. A. B.

PEPINSKY (Raymond). *Crystal structure of lithium hydroxide monohydrate*. Zeits. Krist., 1939, vol. 102, pp. 119-131, 4 figs.

Lithium hydroxide monohydrate is monoclinic-prismatic with unit-cell dimensions a 7.37, b 8.26, c 3.19 Å., β 69° 42'. The specific gravity is 1.51, unit-cell contents 4($\text{LiOH} \cdot \text{H}_2\text{O}$), and the space-group $C_{2h}^3 = C2$. The crystal-structure of the compound has been worked out fully by Fourier methods. Each lithium atom is situated within a tetrahedral group of four oxygen atoms. Two such tetrahedra share an edge in the reflection plane. Upper and lower corners of tetrahedra are shared with unit cells above and below so that unending chains of paired tetrahedra exist in the direction of the c -axis. The chains are linked sideways by hydroxyl bonding.

F. A. B.

LAKE (F. C.). *Order versus disorder in ternary structures including certain spinels*. Journ. Chem. Physics (Amer. Inst. Physics), 1938, vol. 6, pp. 630-635, 3 figs.

In the absence of observed superlattice lines, the structure of mixed crystals is generally assumed to be one of complete disorder. It is shown that in the case of lithium ferrite, while a completely ordered lattice of double or of four times the 'observed' cell-side should show observable superlattice lines, the calculated superlattice lines for an ordered cell of eight times the 'observed' linear dimensions will be weak and in a region of general scattering, so could not be detected; this possible ordered unit cell has an edge of 33 Å. and contains $512\text{Li}_2\text{FeO}_4$. In general, absence of observed superlattice lines cannot be accepted as proof of disorder, since they may be due to an ordered structure with a large unit. M. H. H.

PALACHE (Charles). *Brochantite*. Amer. Min., 1939, vol. 24, pp. 463-481, 36 figs. Correction, p. 727.

Numerous crystals of brochantite from the Shattuck mine, Bisbee, Arizona, of prismatic-tabular habit were measured on the two-circle goniometer and were found to include many crystals twinned on the cleavage plane (010) of the older orthorhombic setting, now called (100) in a new monoclinic setting in which (100) becomes (010) and (001) becomes ($\bar{1}$ 02). $a:b:c = 1.3283:1.0:6.135$, β $76^\circ 39'$. Nineteen new forms are tabulated. X-ray data on a crystal, d 3.97, yield a 13.05, b 9.83, c 58.85 Å., β $76^\circ 38'$; space-group $C_2^5 = P2/a$. The unit-cell contents are $[\text{Cu}_4(\text{SO}_4)(\text{OH})_6]$, and the new optical orientation and refractive indices are α (to a nearly 13°) 1.728, β ($= b$) 1.771, γ ($= c$ very nearly) 1.900. Extinction-angles are too small to measure with certainty, but discontinuity can be observed parallel to (100). F. A. B.

PIRO (Carlo). *Brochantite della miniera di "Sa Duchessa" (Sardegna)*. Periodico Min. Roma, 1939, vol. 10, pp. 327-344, 1 pl., 1 text-fig.

Minute crystals of brochantite from Sardinia [M.A. 7-508] in not being fully terminated show no evidence of the twinning described by Palache (preceding abstract). Laue photographs conform with orthorhombic symmetry, and oscillating crystal photographs gave a 9.82, b 22.75, c 5.94 Å. Transformed to Palache's orientation these values become a' 26.21, b' 9.82, c' 5.94 Å. Goniometric measurements are recorded in Palache's orientation and a further 19 new crystal-forms are noted. Analysis gave SO_3 17.37, CuO 69.88, H_2O 12.19, insol. H_2O 6 = 100.00, agreeing with $4\text{CuO} \cdot \text{SO}_3 \cdot 3\text{H}_2\text{O}$. Sp.gr. 3.939. L. J. S.

PARRISH (William). *Unit cell and space group of monazite, (La,Ce,Y)PO₄*. Amer. Min., 1939, vol. 24, pp. 651-652.

X-ray measurements of crystals of monazite from Llallagua, Bolivia [M.A. 7-508], gave a 6.76, b 7.00, c 6.42 Å., β 76° 50'. The unit cell contains 4(La,Ce,Yt)PO₄ in which the ratio of the rare-earths is 4:1:1 respectively.

F. A. B.

KLEMENT (R.). *Basische Phosphate zweiwertiger Metalle. IV. Strontiumhydroxylapatit*. Zeits. Anorg. Chem., 1939, vol. 242, pp. 215-219, 1 fig.

The strontium compound is prepared in a pure state by heating 1150° Sr₃(PO₄)₂ with SrCO₃ in a current of steam. Impure material was obtained by hydrolysis of SrHPO₄ with NaOH, and by precipitation of Sr salts with alkali phosphate solutions. The data given are compared with the corresponding data for the Ca, Pb, and Ba compounds.

			Ionic radius.	a .	c .	c/a .
Ca ₁₀ (PO ₄) ₆ (OH) ₂	...	...	1.06	9.40 Å.	6.93 Å.	0.737
Sr ₁₀ (PO ₄) ₆ (OH) ₂ ...	...	...	1.27	9.74	7.20	0.739
Pb ₁₀ (PO ₄) ₆ (OH) ₂	...	...	1.32	9.88	7.32	0.741
Ba ₁₀ (PO ₄) ₆ (OH) ₂	...	...	1.43	10.19	7.70	0.756

L. J. S.

STRUNZ (H.). *Identität von Monit, Zeugit, Spodiosit und Apatit*. Naturwiss., 1939, vol. 27, p. 423.

Monite, zeugite, and spodiosite from the original localities gave X-ray powder photographs identical with that of apatite. Spodiosite is evidently a pseudomorph of apatite after some unknown mineral.

L. J. S.

STRUNZ (H.). *Eusynchit, Aräoxen, Pyrobelonit und Descloizit*. Naturwissenschaften, 1939, vol. 27, p. 423.

Eusynchite and araeoxene from the original localities gave X-ray powder photographs identical with that of descloizite. Pyrobelonit [M.A. 1-124], with the a - and c -axes interchanged, gave rotation photographs comparable with descloizite, with which it is isomorphous.

L. J. S.

STRUNZ (H.). *Mineralien der Descloizitgruppe. Konichalcit, Staszicite, Austinit, Duftit, Aräoxen, Volborthit, Pyrobelonit*. Zeits. Krist., 1939, vol. 101, pp. 496-506, 1 fig.

X-ray studies show that higginsite CuCa(VO₄)(OH), and the cryptocrystalline varieties conichalcite and staszicite, austinite ZnCa(VO₄)(OH),

borthite and tangeite $\text{Cu}(\text{Cu}, \text{Ca})(\text{VO}_4)(\text{OH})$, duftite $\text{CuPb}(\text{AsO}_4)(\text{OH})$, and pyrobelonite $\text{MnPb}(\text{VO}_4)(\text{OH})$ all possess crystal-structures similar to that of descloizite $(\text{Zn}, \text{Cu})\text{Pb}(\text{VO}_4)(\text{OH})$. Unit-cell determinations have been made for higginsite a 5.84, b 9.21, c 7.42 Å. and for pyrobelonite a 6.22, b 9.57, c 7.74 Å. [Min. Mag. **23**–376.] F. A. B.

CONNELL (Duncan). *Symmetry of phosphosiderite*. Amer. Min., 1939, vol. 24, pp. 636–642, 4 figs. [M.A. **7**–508.]

X-ray photographs of phosphosiderite crystals from Pleystein, Bavaria [M.A. **1**–125], yield a 5.30, b 9.79, c 8.67 Å., β 89° 24' (gonio-centric); the unit cell contains $4(\text{FePO}_4 \cdot 2\text{H}_2\text{O})$. Etch-figures point to hexahedral symmetry, and the space-group is probably C_{2h}^2 . F. A. B.

GELE (G.) & MACHATSCHKI (F.). *Röntgenographische Untersuchungen an $\text{MgHPO}_4 \cdot 7\text{H}_2\text{O}$ (Phosphor-rösslerit)*. Zentralbl. Min., Abt. A, 1939, pp. 297–300.

Acicular crystals of $\text{MgHPO}_4 \cdot 7\text{H}_2\text{O}$ soon form in the amorphous precipitate from MgSO_4 and Na_2HPO_4 solutions. These are identical with phosphor-rösslerite [M.A. **7**–316] and have a unit cell, a 11.35, b 10.36, c 6.60 Å., $\beta \sim 85^\circ$, containing eight molecules; space-group C_{2h}^6 . These results do not show the looked-for relation between phosphates and sulphates, there being a certain amount of agreement with $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, but not with $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ [M.A. **3**–345]. On exposure to air the colourless needles soon become cloudy and are then pseudomorphs of newberyite ($\text{MgHPO}_4 \cdot 3\text{H}_2\text{O}$). L. J. S.

RITSCH (Haymo). *Die Struktur des Libethenites $\text{Cu}_2(\text{OH})[\text{PO}_4]$* . Zeits. Krist., 1939, vol. 102, pp. 1–12.

The crystal-structure of libethenite is of the andalusite type, like those of adamite and olivenite. The correspondence is revealed when Dana's a and c axes for the mineral are interchanged. The unit-cell dimensions have been redetermined on material from Libethen, Hungary, and agree with those of Strunz a 8.36–8.44, b 8.06–8.09, c 5.89 Å. The unit cell contains $4\text{Cu}_2(\text{OH})\text{PO}_4$ and the space-group is D_{2h}^{12} . (M.A. **6**–414, 37.) F. A. B.

AO (S. H.) & TAYLOR (W. H.). *The lamellar structure of potash-soda feldspars*. Proc. Roy. Soc. London, Ser. A, 1940, vol. 174, pp. 57–72, 3 figs. [M.A. **7**–396.]

HENDRICKS (Sterling B.). *Random structures of layer minerals as illustrated by cronstedite [sic] ($2\text{FeO} \cdot \text{Fe}_2\text{O}_3 \cdot \text{SiO}_2 \cdot 2\text{H}_2\text{O}$). Possible in content of kaolin.* Amer. Min., 1939, vol. 24, pp. 529–539, 3 figs.

Crystals of cronstedtite from Kisbánya in Romania, Kuttentberg Bohemia, and Cornwall yield X-ray photographs agreeing with trigonal symmetry, a 5.48, c 21.25 Å. A modified form of Gossner's suggested crystal-structure [M.A. 6–333] is compatible with the observed intensities of diffraction. The structure is formed from kaolin-like layers enlarged to admit ferric ions with tetrahedral and octahedral co-ordination. These layers are superimposed with a random mixing of three possible structures which results in diffuse reflections along lines connecting (hkl) reflections for which k is not a multiple of three. The mineral faratsihite is shown to be a mixture of nontronite and kaolinite.

F. A. B.

HENDRICKS (Sterling B.). *Polymorphism of the micas.* With optical measurements by MERRILL E. JEFFERSON. Amer. Min., 1939, vol. 24, pp. 729–771, 9 figs.

An X-ray and optical study has been carried out on ninety-nine specimens of mica from known localities, including twelve lepidolite with chemical analyses by Stevens [M.A. 7–353]. Seven different crystalline modifications were discovered. (1) Single-layer monoclinic hemihedral, forty-five specimens observed, including biotite, phlogopite, lepidolite, polyolithionite, zinnwaldite, and tainiolite. (2) Two-layer monoclinic holohedral, muscovite type, twenty-one specimens observed including muscovite, lepidolite, and alurgite. (3) Two-layer monoclinic holohedral, octophyllite type, five specimens observed, including biotite, lepidomelane, and manganophyllite. (4) Three-layer rhombohedral enantiomorphic hemihedral, eight specimens observed, including biotite, phlogopite, alurgite, lepidolite, and zinnwaldite. (5) Six-layer monoclinic hemihedral, three specimens observed, all lepidolite. (6) Six-layer triclinic holohedral, three specimens observed, all biotite. (7) Twenty-four layer triclinic holohedral, one biotite specimen.

Type.	a .	b .	c .	Symmetry.	Unit-cell contents.	Space group.
1	5.3	9.2	10.2 Å.	Monoclinic, β 80°	$2[\text{R}_3(\text{Al}, \text{Si})_4\text{O}_{10}(\text{OH}, \text{F})_2\text{K}]$	$C_2^3 = C_6$
2	5.2	9.0	20.0	Monoclinic, β 84° 30'	$4[(\text{Al}, \text{R})_2(\text{Al}, \text{Si})_4\text{O}_{10}(\text{OH}, \text{F})_2\text{K}]$	$C_{2h}^6 = C_6$
3	5.3	9.2	20.2	Monoclinic, β 85°	$4[\text{R}_3(\text{Al}, \text{Si})_4\text{O}_{10}(\text{OH}, \text{F})_2\text{K}]$	$C_{2h}^6 = C_6$
4	5.3	—	30.0	Rhombohedral,	$3[\text{R}_3(\text{Al}, \text{Si})_4\text{O}_{10}(\text{OH}, \text{F})_2\text{K}]$	$D_3^3 = C_6$
5	5.3	9.2	60.0	Monoclinic, β 90°	$12[\text{R}_3(\text{Al}, \text{Si})_4\text{O}_{10}(\text{OH}, \text{F})_2\text{K}]$	$C_8^4 = C_8$

	<i>a.</i>	<i>b.</i>	<i>c.</i>	Symmetry.	Unit-cell contents.	Space-group.
	5.3	5.3	60.0 Å.	Triclinic, α 90°, β 90°, γ 120°	$6[\text{R}_3(\text{AlSi})_4\text{O}_{10}(\text{OH},\text{F})_2\text{K}]$	$C_2^1 = P\bar{1}$
	5.3	5.3	240.0	Triclinic, α 90°, β 90°, γ 120°	$24[\text{R}_3(\text{AlSi})_4\text{O}_{10}(\text{OH},\text{F})_2\text{K}]$	$C_2^1 = P\bar{1}$

R = Mg²⁺, Fe²⁺, Fe³⁺, Li⁺, Ti⁴⁺, &c.

The crystal-structures of types 1 to 6 have been worked out in detail. Thirteen specimens of biotite and phlogopite, which could not be assigned to any of the types 1 to 7, proved to be mixed structures characterized by yielding X-ray photographs with diffuse scattering for planes (*hkl*) where *k* is not a multiple of 3. [M.A. 4-32, 33, 160, 368, 467; 5-325.]

F. A. B.

Radioactivity.

FRANKMAN (Frans E.). *Some graphs on the calculation of geological age.* Årsbok Sveriges Geol. Undersök., 1939, vol. 33, no. 7 (Avhandl. och Upps., Ser. C, no. 427), 8 pp., 1 pl., 3 text-figs.

Graphs giving age in millions of years from the ratios He/Ra, Th/Ra, $^{206}\text{Pb}/\text{U}$, $^{208}\text{Pb}/\text{Th}$, and $^{207}\text{Pb}/^{208}\text{Pb}$.

L. J. S.

ANDERSON (G. H.) & SPARKS (F. W.). *A quantitative study of pleochroic haloes. IV. New types of haloes.* Proc. Roy. Soc. London, Ser. A, 1939, vol. 173, pp. 238-249, 2 pls., 1 text-fig.

ANDERSON (G. H.). — V. *The genesis of haloes.* Ibid., pp. 250-264. [M.A. 6-35, 36, 518.]

In biotite, in addition to uranium haloes (with 6 rings) and thorium haloes (5 rings), four other types of haloes are distinguished: A (1 ring), B (2 rings), C (3 rings), and D (1 ring). Those of type A appear to be the same as J. Joly's 'emanation' haloes [M.A. 2-161], the others being new. These four types have radii (16.21-34.59 μ) corresponding to the ranges of α -particles of short-lived members of the uranium family, probably RaF, RaB or RaC, and Ra respectively. They are classed as 'distinct' haloes, and the radioactive substance must have been introduced into the mica by hydrothermal solutions. They usually occur along certain cleavage planes or in strings along veins in the mica. Uranium and thorium haloes, which are produced by long-lived parents, probably of magmatic origin (but perhaps also hydrothermal), are classed as 'active' haloes, and in them the darkening of the rings will continue.

L. J. S.

ROTHÉ (Edmond) and HÉE (*M^{me}* A.). *Sur une méthode d'étude de radioactivité des roches*. Compt. Rend. Acad. Sci. Paris, 1940, vol. 210, pp. 30-32.

The method, termed that of 'layers of varying thickness', consists in determining the radioactivity of varying thicknesses of finely powdered rock placed in small trays, all of the same diameter but of varying depth and plotting the measured activity against the thickness. The resulting curves are compared with similar curves given by similarly prepared powders of (I) a neutral salt containing 3.77×10^{-5} gm. $\text{Th}(\text{NO}_3)_4$, and (II) BaCl_2 containing 52.2×10^{-12} gm. RaCl_2 . With I the curve is approximately a straight line; with II the curve ends in a horizontal portion indicating that above a certain thickness the radioactivity depends solely on the surface portion of the sample. Comparison of these standard curves with those given by the powdered rocks gives an approximate indication of the amounts of Th and Ra present. C. A. S.

STRAßMANN (Fritz) & WALLING (Ernst). *Die Abscheidung des reinen Strontium-Isotops ^{87}Sr aus einem alten rubidiumhaltigen Lepidolith und die Halbwertszeit des Rubidiums*. Ber. Deutsch. Chem. Gesellschaft, Abt. B, 1938, vol. 71, pp. 1-9.

The isolation of 0.15 gm. of the pure strontium isotope ^{87}Sr from 1 kg. of lepidolite from Silver Leaf mine, Manitoba, is described. The mica must have arisen by radioactive decomposition of the rarer rubidium isotope ^{87}Rb ; the mica contains about 2 % Rb, and its age is estimated at 2×10^9 years, whence the half-period of ^{87}Rb must be 6.3×10^{10} years. A simplified method for the recovery of traces of Sr from minerals is also described. M. H. H.

WALKE (H. J.). *The helium content of beryls*. Physical Rev. (American Physical Soc.), 1935, vol. 47, p. 969.

READ (John). *Baade and Zwicky's theory of cosmic rays and the helium content of beryls*. Nature, London, 1939, vol. 144, p. 1046.

(1) The suggestion that the helium content of beryl arises from spontaneous (radioactive) break-up of ^8Be or of ^{10}Be is rejected. It is more probable that the helium originates from induced break-up of the beryllium brought about by γ -ray bombardment (from radioactive substances or from cosmic rays).

(2) Baade and Zwicky's theory of super-novae involves an average flux of cosmic rays over long periods of time some 35 times the present value, and it is therefore possible that the helium content of beryl may

se from cosmic ray bombardment of beryllium. [M.A. 5-477, 6-498, 107.]
M. H. H.

ERNST (Ernst). *Über einige Verhältnisse in Uranmineralien. Die Zahl der von Radium emittierten Alpha-Teilchen und das Verhältnis Actinouran:Uran.* Skrift. Norske Vid.-Akad., Mat.-Nat. Kl., 1939, for 1938, vol. 1, no. 4, 60 pp., 1 pl., 11 text-figs.

Various determinations of the radioactivity were made on uraninite minerals of which chemical analyses (I-X) are given. They include a count of the number of α -particles emitted by each mineral; the Ac:U and Ac:Io ratios; the half life of U and actinouranium, &c. X-ray powder photographs are compared with those of the uranium oxides. Decomposition of the minerals was effected by heating them with water and air in a bomb, and analyses were made of the products and of the solution. The green and red products obtained resemble those produced by the natural weathering of uraninite.

I, Cleveite from Aust-Agder, Setersdalen, Norway (also CaO 0.56, loss 1.18). II, Cleveite from Auselmyren, Aust-Agder. III, Cleveite from Arendal (also CaO 0.80, ign. loss 1.58). IV, Bröggerite from Raade, Norway (also CaO 0.45, P_2O_5 0.02, H_2O 0.12). V, Pitchblende from Jáchymov, Bohemia. VI, Pitchblende from Cornwall (also MnO 0.45, P_2O_5 0.39, CaO 1.35 (5.41?), P_2O_5 0.47, S 6.78, H_2O —0.48). VII, Uraninite from Strickland quarry, Portland, Connecticut (also ign. loss 1.40). VIII, Uraninite from Deer Park mine, Spruce Pine, North Carolina. IX, Uraninite from Central City, Colorado (also ign. loss 1.34). X, Pitchblende from Belgian Congo.

	U ₃ O ₈	ThO ₂	PbO	Rare- earths.	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	Insol.	UO ₂ /UO ₃	Ra $\times 10^{-7}$ g/g.
I.	78.76	0.91	11.40	1.00	0.34	0.09	0.52	—	1.18	2.28
I.	79.02	2.58	12.05	2.75	0.31	—	2.98	—	0.71	2.30
I.	79.70	1.77	12.14	1.34	0.32	0.26	1.07	—	0.82	2.30
V.	76.27	7.85	9.63	1.16	0.20	—	3.36	3.65	2.17	2.22
V.	55.64	0.17	1.65	0.47	—	—	—	—	1.26	1.52
I.	38.60	0.00	4.05	0.25	—	0.23	19.44	—	4.04	1.12
I.	87.72	3.28	3.14	2.42	1.00	—	1.10	2.35	3.80	2.38
I.	87.5	2.92	3.92	5.62	1.36	—	1.85	1.60	—	2.36
I.	82.99	0.14	0.39	trace	3.42	—	4.52	5.13	1.54	2.25
I.	67.46	9.82	8.52	5.33	1.49	—	0.38	0.23	0.31	1.94

L. J. S.

FRENCH (O. B.). *Pied des Monts uraninite.* Journ. Amer. Chem. Soc., 1939, vol. 61, pp. 2742-2744.

Uraninite from Lac Pied des Monts, Quebec, contains U 49.25, Pb 6.67 (common lead isotope 6.40 %), Th trace. The Pb/U ratio gives an age of 920 million years.

L. J. S.

VANDENDRIESSCHE (A.). *La pechblende du nouveau gîte uranifère Kalongwe*. Ann. Service Mines, Katanga, 1936, vol. 6 (for 1935), pp. 70–80, 2 figs. [M.A. 6–520.]

BAUDISCH (Oskar) & BREWER (Keith). *Geochemistry of the Saratoga basin: the radioactivity of Saratoga spring waters and rocks*. A. Journ. Sci., 1939, vol. 237, pp. 811–817.

The spring waters of Saratoga Springs, New York, contain rad. $0.6\text{--}1.6 \times 10^{-10}$ gm. per litre, and the spring water deposits $0.75\text{--}1.27 \times 10^{-10}$ gm. per gm. Volcanic rock contains 1.2, syenite 1.62, shale 4.2, sandstone nil, allanite 35.5×10^{-12} gm. per gm. L. J. S.

PERUTZ (Max). *Radioactive nodules from Devonshire, England*. Z. Petr. Mitt. (Tschermak), 1939, vol. 51, pp. 141–161, 13 figs.

The vanadiferous nodules in the Permian marls of Budleigh Salterton (Min. Mag. 1931, 22, 609) are further described, with speculations as to their origin. The slight radioactivity is concentrated in a film at the margins of the dark core. Estimates of uranium in the dark material gave 0.3–0.5 % U. Minute specks with metallic lustre have been identified as niccolite, but no vanadium or uranium mineral could be identified. New analyses of the bleached aureole and the surrounding red clay show 0.24 and 0.10 % V_2O_3 respectively, and less Fe_2O_3 in the former. L. J. S.

FRIEND (J. Newton) & VALLANCE (R. H.). *Vanadiferous nodules in Worcester clay*. Nature, London, 1939, vol. 144, p. 286.

Small nodules with black or grey centres (up to 0.8 mm.) and grey aureoles (1–2 cm. diam.) have been found in the red clay of the Keuper marls at Worcester. The black and grey centres contain 5.6 and 8.1 % V_2O_5 respectively, with traces of titanium. Radioactivity and presence of nickel could not be detected. L. J. S.

Pseudomorphs.

SEKANINA (Josef). *O původu krystalových otisků v hostákovských křídlech*. [On the origin of crystal impressions in the quartzites of Hostákov.] Sborník Přírodovědeckého Klubu Třebíč (Morav.), 1937, pp. 69–74, 2 pls. (Czech with German summary.)

Masses of zonally coloured amethyst, milky and smoky quartz with large cavities from which crystals of calcite have been removed. The crystals were of tabular habit *cr* or *cm*; others with *v* or *c* and (5161). F. J.

EBORNE (F. Fitz). *Preliminary notes on pseudomorphs after spinel from Kilmar, Quebec*. Univ. Toronto Studies, Geol. Ser., 1938, no. 41, pp. 39-44, 1 pl.

White nodules and rounded octahedra (up to 6 cm. edge) in serpentine near the dolomite contact appear to consist of hydrotalcite, sometimes with relics of spinel in the core. L. J. S.

MAGGATT (H. G.). *On the occurrence of glendonites in New South Wales, with notes on their mode of origin*. Journ. Roy. Soc. New South Wales, 1938, vol. 71 (for 1937-38), pp. 336-349, 1 fig.

The stratigraphical horizons of glendonite in Permian marine glacial deposits of New South Wales are recorded and six new localities noted. The deposition of glauberite or of concretionary CaCO_3 was controlled by the temperature. It is suggested that the 'pineapple' pseudomorphs in the Cretaceous of White Cliffs, New South Wales, were deposited at a low temperature as glauberite, which was replaced first by calcite and afterwards by opal. L. J. S.

EDGE-SMITH (T.). *Glendonites and other fossil crystals*. Australian Mus. Mag., 1938, vol. 6, pp. 337-339, 2 figs.

Pseudomorphs after glauberite occur in Triassic volcanic rocks in New Jersey [M.A. 4-230]; as glendonite (impure calcite after glauberite) in Permian mudstones in New South Wales; and as the 'pineapple' pseudomorphs (opal after glauberite) in Cretaceous sandstone at White Cliffs, New South Wales. L. J. S.

ARMAN (N. L.). *Pseudomorphs after leucite in the "mica-trap" of the Jharia coalfield*. Current Sci. Bangalore, 1939, vol. 8, p. 421, 1 fig.

Rounded grains in the groundmass of the rock consist of orthoclase in a spherulitic intergrowth of feldspar and quartz, and are probably pseudomorphs after leucite. L. J. S.

RIESMEYER (Lincoln R.). *Vein quartz pseudomorphs of cross-fibre asbestos in Virginia*. Amer. Min., 1937, vol. 22, pp. 701-719, 5 figs.

A fibrous habit is typical of certain minerals, and in others it has been induced by conditions of growth. Examples of fibrous quartz in veins are quoted from the literature and several new occurrences are mentioned. Here the fibrous structure is secondary, and is due to replacement of an asbestiform mineral, which in Virginia was actinolite. L. J. S.

ROGERS (Austin F.). *Fossil termite pellets in opalized wood from Santa Maria, California*. Amer. Journ. Sci., 1938, ser. 5, vol. 36, pp. 383-392, 3 figs.

Portions of the specimen described, in which the cell structure of the original wood has been obliterated, are occupied by small (0.8×0.4 mm) bodies with rounded and hexagonal outlines, which at first suggest pseudomorphs of opal after quartz crystals. Interspaces between them are filled with a more transparent opal (n 1.45) with spherulitic structure and resembling lussatite, which consists of opal with embedded fibres of chalcedony. L. J. S.

BARKSDALE (Julian D.). *Silicified wood in dolomite*. Amer. Min., 1939, vol. 24, pp. 699-704, 3 figs.

A description of black petrified wood from the Upper Triassic dolomite beds of the Sonoma Range, Nevada. The preserving medium in all specimens is predominantly granular quartz. Where the wood is well preserved the quartz growth was influenced by the cell walls. F. A. B.

Topographical Mineralogy.

RAIMONDI (Antonio) [1826-1890]. *Minerales del Perú. Descripción mineralógica detallada de 1617 muestras de la república. Versión literal extractada de sus cinco grandes cuadernos manuscritos*. Vol. 1. Lima, Peru, 1939, x+609+9 pp. 32×22 cm.

This large volume, with a preface by J. A. Broggi, has been produced from A. Raimondi's own description of a collection of 1617 mineral specimens which is now in the Natural History Museum of Peru at Lima. It gives detailed descriptions of individual specimens arranged topographically under departments, provinces, and districts. The descriptions themselves are useless, but the precise statement of localities is of value. This forms a companion volume to the same author's 'Minéraux du Pérou' (Paris, 1878), in which specimens in another of his collections were more systematically described under each of the mineral species. L. J. S.

STEPHENS (F. J.). *Redruth, North Gwennap, and Illogan*. Mining Magazine, London, 1939, vol. 61, pp. 83-90, 7 figs.; pp. 140-152, 9 figs.; pp. 215-221, 7 figs. [M.A. 7-335.]

Early work in this ancient mining district is briefly described, preceded by a reference to the family of Williams of Scorrier and illustrated by reproductions of some old prints and by photographs. The author

is been able to make use of notes left by W. G. Vivian and his brother, Joseph Vivian, of Reskadinnick. W. C. S.

ENGBURY (Arthur W. G.) & FRIEND (J. Newton). *Occurrence of greenockite in the Mendips*. Nature, London, 1939, vol. 144, p. 1013.

Films of earthy greenockite occur on blende at Green Ore, near Newton Mendip, where smithsonite was formerly mined. L. J. S.

ENGBURY (Arthur W. G.). *A new British locality for fluorite in Somerset*. Nature, London, 1939, vol. 144, p. 1013.

Small crystals (*af*) of fluorite, colourless to purple and black and sometimes zoned, have been found in small amount, together with chalcopyrite and haematite, in calcite vesicles in Carboniferous Limestone in a disused quarry in Shipham gorge, near Axbridge. L. J. S.

ENGBURY (Arthur W. G.). *Occurrence of bismuthinite in Somerset*. Nature, London, 1940, vol. 145, p. 351.

Small quantities of bismuthinite, together with chalcopyrite, bornite, and chalcosine, have been found in chalybite from the dump of the abandoned Langham Hill mine in the Brendon Hills. L. J. S.

ANN (J. A.). *Bismuthinite and bismutosphaerite from Manbhum*. Rec. Geol. Surv. India, 1938, vol. 73, pp. 299–300, 1 pl.

ANN (J. A.) & RAO (V. B.). *Apatite and allanite in barytes from Manbhum*. Ibid., pp. 300–301.

Near Malthole in Manbhum district, Bengal, bismuthinite is intimately overgrown with galena, and the alteration products are bismutosphaerite and cerussite. Green prisms of apatite (*d* 3·19, *n* 1·630) and tiny crystals of allanite are embedded in white tabular baryte.

L. J. S.

EXNER (Heinz). *Arseniosiderit von Hüttenberg, Kärnten*. Zentr. Min., Abt. A, 1939, pp. 287–289.

An ochre-yellow felted mass, resembling 'mountain leather', consists of fine needles and is identified as arseniosiderite. It is associated with pyrochroite, symplectite, pitticite, pharmacosiderite, and trögerite on siderite. L. J. S.

ROVY (Géza). *Kvarckristályok Czákról*.—SZUROVY (G.). *Quarzkristalle von Czák*. Földtani Közlöny, Budapest, 1939, vol. 69, pp. 52–58, 6 figs. (Hungarian with German summary.)

Crystals of quartz from Czák, near Kőszeg, com. Vas, up to 12 mm.

show the forms $m r M h s \Gamma z x u$ [Dana's letters] and (0553). Large crystals, up to 20 mm., are more simple. Vicinal pyramids suggest that the crystals were formed below 575° C. Most of them are left-handed. Dauphiné twins are common. V. Z.

ERDÉLYI (János). *A nadapi barit és hematit.*—ERDÉLYI (J.). *Der Barit und Hämatit von Nadap.* Földtani Közlöny, Budapest, 1939, vol. 69, pp. 290–296, 4 figs. (German only.)

Crystals of baryte from Nadap, com. Fejér, tabular on c and up to 5 mm. thick, show the forms $a c m \lambda \eta u d D z$ [Dana's letters] and no δ_2 (827). Crystals of haematite, tabular on c and up to 5 mm. diameter and 1.5 mm. thick, from fissures in aplite show $c r e N a n z \chi$ [Dana's letters] with c and r predominating. V. Z.

TOKODY (László). *Kristálytani vizsgálatok magyarországi piriteken.* TOKODY (L.). *Kristallographische Untersuchungen an ungarischen Pyriten.* Földtani Közlöny, Budapest, 1939, vol. 69, pp. 141–160, 201–219, 42 figs. (German only.) [M.A. 7–361.]

HARADA (Zyunpéi). *Zur Kenntnis der japanischen Bormineralien (Studien über japanische Bormineralien. IX).* Journ. Fac. Sci. Hokkaido Univ., Ser. IV, vol. 5, pp. 1–122, 35 figs.

Collected accounts from the literature, together with some new data are given of tourmaline, danburite, ludwigite, dumortierite, datolite and axinite from Japanese localities. [M.A. 5–38; 7–358, 359, 411, 412.] L. J. S.

ROYER (Louis). *Sur la nature minéralogique de quelques substances minérales nord-africaines: étude aux rayons X.* Compt. Rend. Acad. Sci. Paris, 1939, vol. 208, pp. 1591–1593.

The pisolites of Hammam Meskoutine (formed in a spring of temperature 95° and of shapes suggesting that they once were plastic and have been squeezed) and of the Carlsbad springs are both aragonite, while those of Hammam Bou Hadjar (63°) are calcite. There is nothing to confirm the suggestion that the first-named were ever plastic, or that they consist of a third form (ktypeite) of CaCO_3 . The kieselguhr of Oran consists of 85–95% amorphous SiO_2 with small amounts of CaCO_3 , Fe_2O_3 , Al_2O_3 , and organic matter. Heated above 1000° it passes to varying degree into tridymite. The SiO_2 of silicified wood of Algeria is quartz. The $\text{Ca}_3(\text{PO}_4)_2$ of the north African phosphates, bone deposits

marks' teeth, &c., all give the radiograms of apatite, as also do the proclites of Redyef, collophanite of Boub Toumai, and the quercyites.

C. A. S.

HALL (A. L.). *Analyses of rocks, minerals, ores, coal, soils and waters from southern Africa*. Mem. Geol. Surv. South Africa, 1938, no. 32, 868 pp. Price 15s.

The compilation includes 5621 analyses available at the beginning 1936, and is divided into two parts, 3709 analyses dealing with the Union and S.-W. Africa, and the remainder with other countries of southern Africa. Previously unpublished analyses of South African material include those of economic minerals, coal, and soil. E. D. M.

KN EEDEN (O. R.). *The geology of the country around Bethlehem and Kestell. With special reference to oil indication*. Mem. Geol. Surv. South Africa, 1937, no. 33, 60 pp., 1 map, 14 pls., 3 text-figs. Price 7s. 6d. (including map).

The area of over 100 sq. miles consists of fairly horizontal beds of the Taunton and Stormberg series intersected by a network of dolerite dykes. Small quantities of hydrocarbons are found in, and associated with, the dolerite and the lower portion of the Drakensberg lavas, and these probably been brought up in the magma from underlying carbonaceous sediments, although they may be magmatic. Hisingerite occurs in amygdaloids in the lavas but seems to be unconnected with the hydrocarbons. There is no prospect of the occurrence of petroleum.

E. D. M.

FRY (Leslie E.). *The geology of a portion of Victoria County, Natal*. Trans. Geol. Soc. South Africa, 1939, vol. 41 (for 1938), pp. 1-36, 1 map, 1 pl., 1 text-fig.

The region mapped is a coastal area north of Durban comprising mainly Table Mountain, Dwyka, and Eccles series with dolerite intrusions. Heavy residues from dune-rock and coastal sands are described and support an aeolian origin for the former. A deposit of massive talc in the Dwyka probably represents an altered peridotite and deposits of kaolin occurring in Table Mountain sandstone are ascribed to original felspar.

E. D. M.

HAMILTON (G. N. Gordon). *The geology of the country around Kubuta (southern Swaziland)*. Trans. Geol. Soc. South Africa, 1939, vol. 41 (for 1938), pp. 41-81, 1 map, 5 pls., 1 text-fig.

An area of about 100 sq. miles comprises principally granite, Upper

Pongola sediments, and Karroo dolerites. The granite is partly pre-Pongola and gneissic and in part a massive red post-Pongola granite associated with minor intrusions. The Upper Pongola beds appear to be of Witwatersrand age. Brief mention is made of gold, iron, copper, lead, tin, and talc. E. D. M.

LIGHTFOOT (B.). *Notes on the south-eastern part of Southern Rhodesia*. Trans. Geol. Soc. South Africa, 1939, vol. 41 (for 1938), pp. 193-194 pls.

A rough geological map of this little-known area shows outcrops of gneiss, Karroo sandstone, basalt, granophyre, rhyolite, and Plateau sandstone. Petrographic descriptions are supported by chemical analyses by E. Golding. E. D. M.

Miscellaneous.

TOMLINSON (W. Harold). *Corundum in a dike at Glen Riddle, Pennsylvania*. Amer. Min., 1939, vol. 24, pp. 339-343, 3 figs.

Corundum occurs together with hyalophane in a narrow plagioclase dike cutting serpentized pyroxenite. The corundum is found only at the borders of the dike where the plagioclase approaches the composition of anorthite, and is supposed to have been formed by high-temperature volatile reactions on that mineral. F. A. B.

GOLDMAN (F. H.) & DALLAVALLE (J. M.). *An accurate method for the determination of the components of a heterogeneous particulate mineral system*. Amer. Min., 1939, vol. 24, pp. 40-47, 1 fig.

Quartz, hornblende, orthoclase, and dolomite powders $< 200 \sim 325$ mesh were prepared and two component mixtures of known proportions were made up and slides of each sample examined under the microscope, the particles in a field being identified, measured, and counted. By plotting the size-frequency data for each mineral on a log-probability grid the average volume diameter of a particle may be calculated. Although all four minerals were crushed and sieved in the same way the average volume diameters show large differences, explaining how the assumptions of uniformity of size and shape lead to wrong estimates of percentages of minerals in rock dusts and powders. If, in addition to the average volume diameter, the shape factor and specific gravity of each mineral is determined, the particle counts lead to accurate percentage determinations for each mineral component. F. A. B.

STEWART (Glenn W.). *Vesuvianite and fluorescent apatite from Center Strafford, New Hampshire*. Amer. Min., 1939, vol. 24, pp. 274–275. Brown radiating columnar idocrase, forms m (100), p (111), refractive indices ω 1.710, ϵ 1.702, some of which is replaced by orthoclase (α 1.519, β 1.525, γ 1.527, $2V$ 65°), is described. Above the idocrase lies a small mass of pale-blue to colourless fluorapatite, ω 1.632, ϵ 1.629, which fluoresces with a strong orange colour in ultra-violet light from a mercury-vapour lamp. F. A. B.

HALDSCHMIDT (W. A.) & GAINES (R. V.). *Occurrence of chrysoberyl near Golden, Colorado*. Amer. Min., 1939, vol. 24, pp. 267–271, 5 figs. Large, olive-green, single and twinned crystals of chrysoberyl are described from a felspar quarry in a pegmatite dike near Drew Hill, ten miles from Golden. An analysis of the mineral, sp. gr. 3.648, by W. P. Rhoder, yields BeO 19.15, Al_2O_3 76.34, FeO 3.60, TiO_2 0.55, loss on ignition 0.30, SiO_2 , Mn traces, total 99.94. Forms present on a well-terminated small crystal are $abmsron$ [Dana's letters]. F. A. B.

OLEY (Frank C.) & WEST (Philip W.). *Qualitative determination of fluorine in minerals*. Amer. Min., 1939, vol. 24, pp. 398–399, 1 fig. A method based upon the fading from pink to yellow of a zirconium-tartrarin lake in the presence of fluorine. F. A. B.

KNDELL (E. B.) & PERLICH (R. W.). *Determination of nickel and cobalt in silicate rocks*. Ind. Eng. Chem., Analytical Edition (Amer. Chem. Soc.), 1939, vol. 11, p. 309–311.

New methods are described for the determination of nickel and cobalt in silicate rocks in quantities down to 0.0001 % on a sample of 1 gram or less. M. H. H.

MACOCK (M. A.) & MICHENER (C. E.). *On rammelsbergite from Ontario*. Univ. Toronto Studies, Geol. Ser., 1939, no. 42, pp. 95–112, 8 figs. Compact, fine-grained, tin-white nickel arsenide, sp. gr. 7.12, from Moose Horn mine, Elk Lake, Gowganda, Ontario, analysed by G. W. Rogers, yields Ni 28.1, Co 0.4, As 68.5, S 2.6, total 99.6. A fragment of tabular crystal 0.5 mm. across gives a 5.74, b 5.81, c 11.405 Å., space-group $D_{2h}^{11} = Pbma$ or $C_{2v}^5 = Pb2a$, and the unit cell contains $8NiAs_2$. The same crystal fragment exhibits the forms $c(001)$ parallel to a good cleavage, $d(104)$, $e(304)$, $p(113)$, $q(112)$ [axial ratios $a:b:c = 0.988:1:0.63$]. Polished sections, chemical analyses, and powder photographs show that this mineral is practically identical with similar material

from the Hudson Bay mine, Cobalt, Ontario [M.A. 1-410]. Although its chemical composition is close to the textbook formula for rammelsbergite, the crystallographic data and good *c* cleavage distinguish it from rammelsbergite originally described from Schneeberg [M.A. 7-469.]

F. A. B.

CAVINATO (Antonio). *Brochantite di "Sa Duchessa" (Sardegna)*. Periodico Min. Roma, 1939, vol. 10, p. 259 [M.A. 7-493.].

Radiating aggregates of acicular crystals, (110), (011), (101) ga. CuO 70.34, SO₃ 18.0 %, agreeing with CuSO₄.3Cu(OH)₂. L. J. S.

GORDON (Samuel G.). *Greenockite from Llallagua, Bolivia*. Notulae Naturae, Acad. Nat. Sci. Philadelphia, 1939, no. 1, 6 pp., 8 figs.

Minute (0.05 mm.) red crystals of greenockite occur with wavellite and marcasite pseudomorphous after pyrrhotine. They are pyramidal and prismatic in habit with the forms *c m o l i* (Dana's letters). Cyclic twins on (10 $\bar{1}$ 2) consist of three individuals around a central one. Twins of this type are also shown by wurtzite from Frisco, Utah. L. J. S.

GORDON (Samuel G.). *Thorium-free monazite from Llallagua, Bolivia*. Notulae Naturae, Acad. Nat. Sci. Philadelphia, 1939, no. 2, 7 pp., 8 figs.

Flesh-pink crystals (up to 1 cm.) occur with cassiterite, wolframite, tourmaline, xenotime, &c. They are usually prismatic, but with prominent *i* ($\bar{2}$ 11) they are sometimes pyramidal in habit; 14 crystal forms were measured. α 1.785, β 1.787, γ 1.840. Analysis gave P₂O₅ 29.29, SiO₂ 0.27, ThO₂ nil, Ce₂O₃, &c., 31.41, La₂O₃, &c., 33.19, Yt₂O₃, &c., 5.08, MgO 0.22, CaO 0.34 = 99.80, sp.gr. 5.173. L. J. S.

GORDON (Samuel G.). *Wulfenite, ralstonite, and thomsenolite from Ivigtut, Greenland*. Notulae Naturae, Acad. Nat. Sci. Philadelphia, 1939, no. 11, 2 pp., 4 figs.

Cavities in a mass of cryolite and fluorite contain small crystals of thomsenolite, tabular in habit, with the forms *m c x*; colourless octahedra and cubo-octahedra of ralstonite with *n* 1.399; and greyish-yellow pyramidal crystals of wulfenite with the forms *o d e* [Dana's letters] and (340). L. J. S.

STRUNZ (H.) & SZTRÓKAY (K. v.). *Isodimorphie zwischen Metavariscit, Variscit, Phosphosiderit und Strengit*. Zentr. Min., 1939, Abt. 1, pp. 272-278.

X-ray measurements gave for phosphosiderite, FePO₄.2H₂O, *a* 5.0

0.75, c 8.71 Å.; for strengite a 10.06, b 9.85, c 8.65 Å.; and for scorodite 10.26, b 9.98, c 8.88 Å. The axial ratios of these are compared with those of variscite and metavariscite, $\text{AlPO}_4 \cdot 2\text{H}_2\text{O}$ [M.A. 2-421], in an isodimorphous series. It is probable, however, that the orthorhombic form is related to the monoclinic by minute twinning on (100).

Orthorhombic	$a:b:c$	Monoclinic $\beta \sim 90^\circ$	$a:b:c$
Strengite	1.0229:1.0.8862	Phosphosiderite	0.5449:1.0.8968
Variscite	1.0217:1.0.8918	Metavariscite	0.5459:1.0.8944
Scorodite	1.0312:1.0.8966	Clinoscorodite?	—

L. J. S.

WARREN (H. V.). *An occurrence of cosalite in British Columbia*. Univ. Toronto Studies, Geol. Ser., 1939, no. 42, pp. 151-155.

Visible gold in the Cariboo gold quartz mine is closely associated with fibrous cosalite and massive galenobismutite. The acicular crystals of cosalite are much striated parallel to their length and they have a perfect pinakoidal cleavage in this direction. Analyses, S 16.40 (15.80), 39.35 (38.28), Pb 41.20 (41.29), Cu 3.60 (n.d.), insol.—(1.79), totals 100.55 (97.16), agree with $2(\text{Pb,Cu})\text{S} \cdot \text{Bi}_2\text{S}_3$. [M.A. 7-490.] L. J. S.

WAKLEY (Kenneth P.). *The nature and origin of flint*. Sci. Progr. London, 1939, vol. 34, pp. 277-286.

A useful summary is given of the nature and constitution of flint and of the various views as to its mode of origin. Prominence is given to the physico-chemical theory of V. Wroost (1936). This supposes that rain-water charged with CO_2 would (after saturation with $\text{CaH}_2(\text{CO}_3)_2$) contain some free CO_3 ions, which would convert the opal of sponge spicules into a colloidal sol capable of travelling downwards until CO_3 is lost.

L. J. S.

WUGGE (Jens) & NEUMANN (Henrich). *Et fund av kullblende i esserittlava, Semsvika, Asker*. Norsk Geol. Tidsskrift, 1938, vol. 18, pp. 374-375.

A 'mineral coal' [anthraxolite?] occurs, together with calcite, quartz, epidote, and prehnite, in cavities in essexite lava at this locality near Oslo. Analysis by L. Lund gave C 86.5, H 2.9, N 0.7, S 0.5, halogens trace, ash 3.7, O (diff.) 5.7; sp. gr. 1.3-1.4.

L. J. S.

WUTHERFORD (R. L.). *Anthraxolite from South Nahanni river, Northwest Territories*. Univ. Toronto Studies, Geol. Ser., 1939, no. 42, pp. 123-125.

Brittle material breaking into rectangular blocks and with many

fractures filled with quartz gave: fixed carbon 85.9, volatile matter 6.1, moisture 1.9, ash 6.2 % (C 87.50, H 1.75, ash 6.3). [M.A. 3-457, 4-14]

L. J. S.

THOMSON (Ellis) & ALLEN (J. S.). *Nickeliferous pyrite from the Denis mine, Sudbury district, Ontario*. Univ. Toronto Studies, Geol. Ser. 1939, no. 42, pp. 135-138, 1 pl.

Polished sections of the 'beyrichite ore' from this mine show cream light violet-cream, and violet-cream coloured portions, sometimes zonal arrangement in the cubic crystals. Analysis of material, consisting mainly of the creamy portion, gave S 51.39, Fe 38.54, Ni 6.50, Cu 0.1 insol. 3.80 = 100.23. An X-ray powder photograph is identical with that of ordinary pyrite. Blueite and whartonite (S. H. Emmens, 1899) from the Sudbury district are also nickeliferous pyrite.

L. J. S.

MEEN (V. B.). *Vesuvianite from Great Slave Lake region, Canada*. Univ. Toronto Studies, Geol. Ser., 1939, no. 42, pp. 69-74, 3 figs.

Greenish-brown crystals (up to 1 inch long) of idocrase from pre-Cambrian sediments near a granite contact at Turnback Lake show 12 crystal forms; ω 1.712, ϵ 1.708. Analysis gave SiO_2 36.68, TiO_2 0.8, Al_2O_3 15.62, BeO 1.07, Fe_2O_3 2.81, FeO 2.96, MnO 0.46, MgO 1.3, CaO 35.88, Na_2O 0.10, K_2O 0.03, $\text{H}_2\text{O} +$ 0.84, $\text{H}_2\text{O} -$ 0.04, F 2.03, total less O for F 99.87, corresponding with the unit-cell [M.A. 5-28] content $(\text{Ca}, \text{Mn}, \text{Na}, \text{K})_{38}(\text{Al}, \text{Be}, \text{Fe}''', \text{Fe}'', \text{Mg}, \text{Ti})_{27}\text{Si}_{36}(\text{O}, \text{OH}, \text{F})_{152}$, in close agreement with Machatschki's formula [M.A. 5-215.]

L. J. S.

ELLSWORTH (H. V.). *Transparent green pyroaurite from Ontario*. Univ. Toronto Studies, Geol. Ser., 1939, no. 42, pp. 33-45, 1 fig.

Pyroaurite, usually described as being yellow in colour, has been found as small (1 mm.), green, barrel-shaped crystals with magnetite in crystalline pre-Cambrian dolomite in Calvin township. When heated it assumes a gold-like aspect. The crystals have a micaceous basal cleavage and are optically uniaxial, ω 1.560, ϵ 1.543, with strong pleochroism, ω yellow to brown, ϵ nearly colourless. Analysis, Fe_2O_3 23.1, MgO 35.84, MnO 0.01, CO_2 7.30, $\text{H}_2\text{O} +$ 32.97, $\text{H}_2\text{O} -$ 0.69 = 100.0 gives $\text{Fe}_2\text{O}_3 \cdot 6\text{MgO} \cdot \text{CO}_2 \cdot 12-13\text{H}_2\text{O}$. The dehydration curve shows loss at about 150° (5H₂O), 220° (2H₂O), and 270° (5-6H₂O). The dehydrated material is yellow in colour and still optically uniaxial with $\omega > 1.74$.

L. J. S.